SCIENTIFIC AMERICAN

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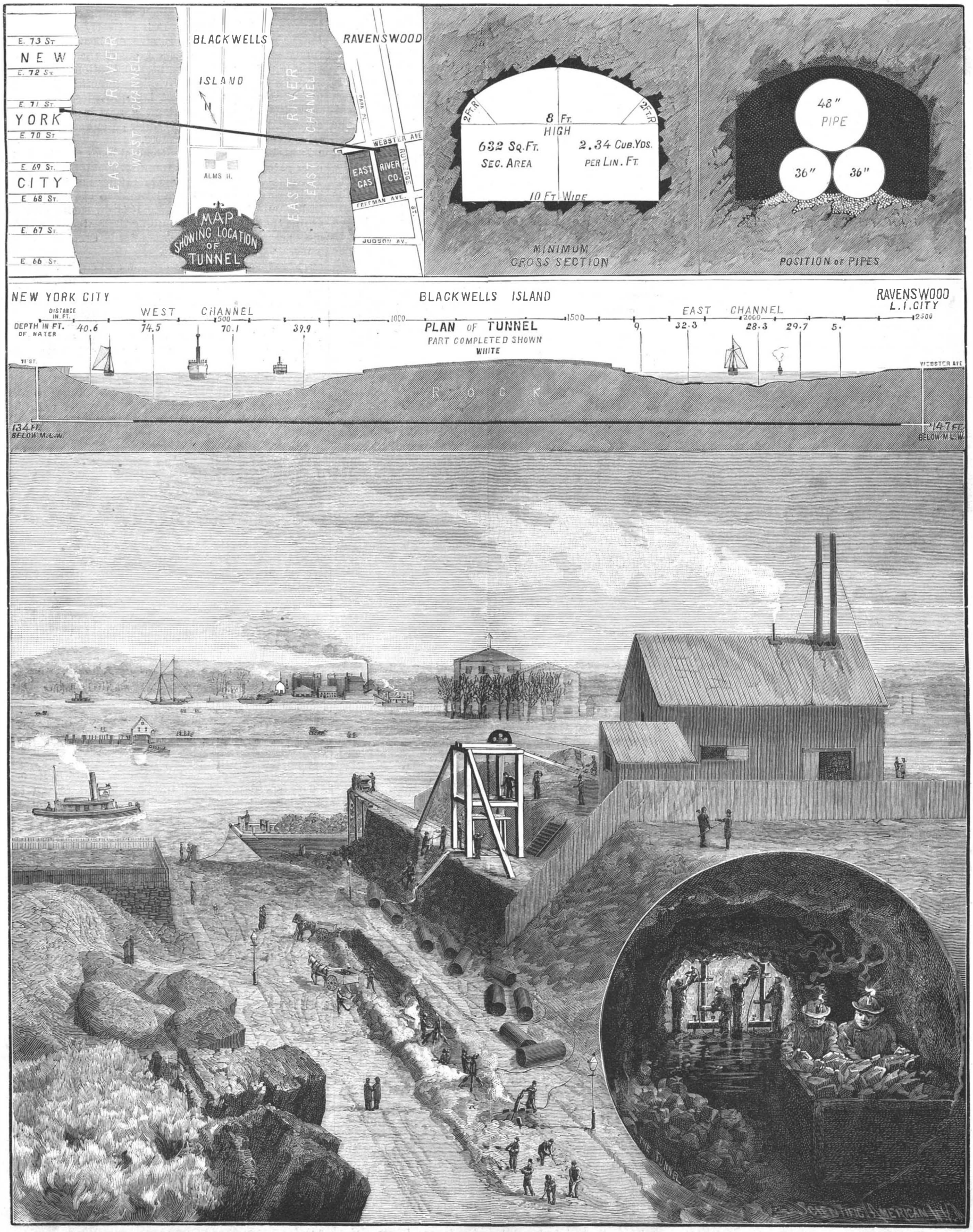

NEW METHOD OF GAS SUPPLY FOR NEW YORK CITY. SHOWING TUNNEL UNDER THE EAST RIVER.—[See page 119.]

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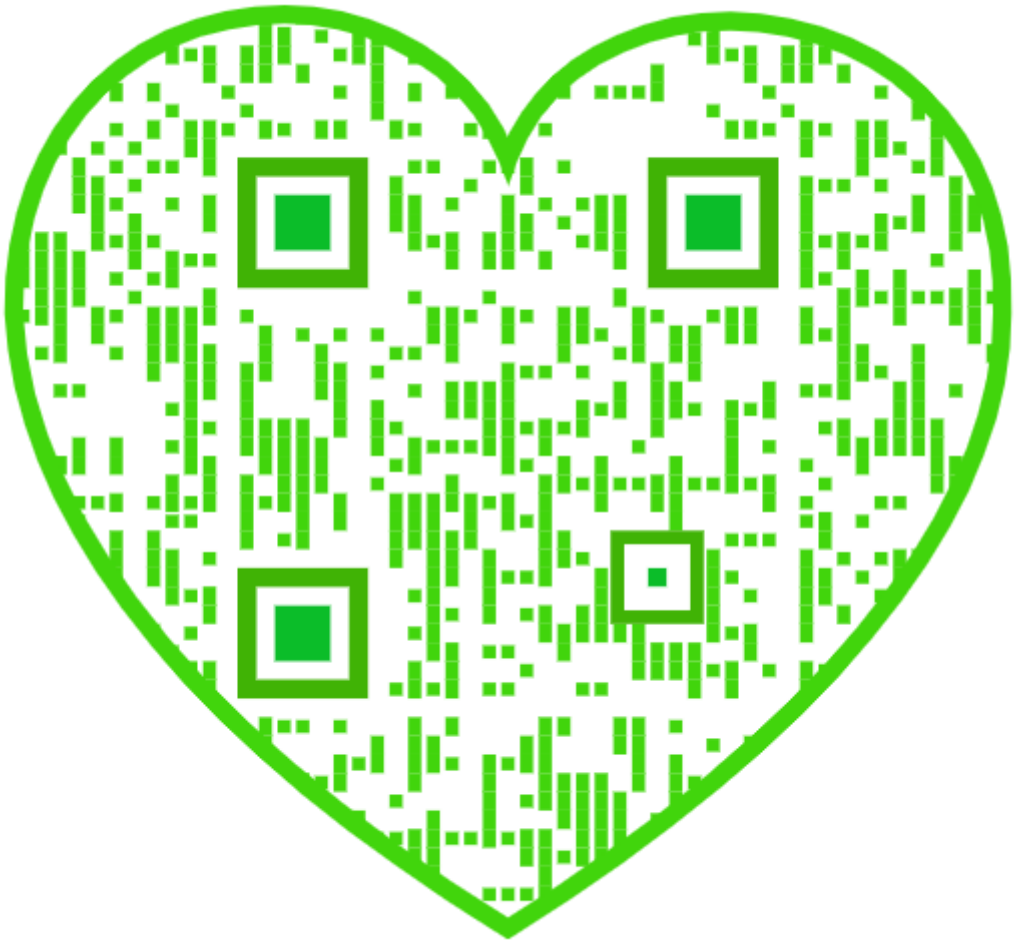

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NEW YORK, SATURDAY, FEBRUARY 25, 1893.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural devices, improved.. 124
Antiseptic paper..... 123
Beer, boric acid in..... 120
Bicycle, the..... 122
Books and publications, new. ... 124
Canals, Panama and Nicaragua.. 119
Climates of Colorado..... 116
Cobalt plating..... 121
Cremation, modern..... 120
Cycle, the Lovell diamond*..... 117
Electrical devices some new..... 124
Electric lighting of Rome..... 121
Electric railways, progress of... 114
Elevator shifting device, Flemming's*..... 117
Elixir of cascara sagrada..... 119
Engine traction, Stout's*..... 117
Esparto grass..... 115
Fair, World's, Chicago..... 115
Fire, a peculiar..... 118
Foundry experience, unusual..... 118
Fox dogs, Siberian*..... 123
Gas supply, New York, new method of*..... 113
Green, Dr. Norvin..... 115
Hybrids, strange*..... 123
Ibex kids*..... 123
India rubber, good vulcanized... 118
Inventions, recently patented... 124
Labels on glass, iron, etc..... 122
Lunatics, commitment of..... 116
Maple sugar, artificial..... 116
Mechanical inventions, recent.. 124
Mesmerism, the new 117
Microphone patent, the Berliner 114
Notes and queries..... 124
Oyster grounds, natural, South Carolina*..... 121
Patent, decisions, recent..... 122
Patents granted, weekly record.. 125
Radiation through vacua..... 118
Screwdriver, the Howard-Allard 118
Shafts, wire, for steamers..... 122
Steamer Elrie, singular accident to*..... 116
Steam power, world's use of..... 118
Tunneling the Simplon..... 118
Tunnel under East River, N. Y.* 113
Vipers, Ceylon..... 122
Volcano Mauna Loa, Hawaii*.... 121
Water, hot, distribution, Paris*. 120
Wrench, Kraft's*..... 117

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 895.

For the Week Ending February 25, 1893.

Price 10 cents. For sale by all newsdealers.

PAGE

I. CHEMISTRY.—Cicuta Maculata, Linne.—By AUGUSTUS S. BLACKMAN.—Notes on this poisonous plant, which has already produced numerous cases of poisoning, with analysis of the finely powdered dried roots..... 14307

II. CIVIL ENGINEERING.—The London Hydraulic Power Company.—A company for supplying hydraulic power in London for running elevators in private dwellings and doing other similar work.—Full details of the plant and of its operations.—6 illustrations..... 14296

III. ELECTRICITY.—Electro-Magnetism.—Notes on the measurement of the intensity of the electro-magnetic field of force..... 14302

The Engineering Details of the New York-Chicago Long Distance Telephone Line.—By JOS. WETZLER.—A valuable paper, giving the particulars of the construction of this great line, size of wire used, and other details.—2 illustrations..... 14303

Improved Electric Drill.—A self-contained drill operated by an electric motor, of great convenience and adaptability.—1 illustration..... 14302

The Electric Railway in New Zealand.—The trolley line in Dunedin, New Zealand.—1 illustration..... 14302

IV. PHOTOGRAPHY.—Breadth in Photographs.—An excellent paper on general effect in photography, the photographic and artistic methods of attack..... 14303

V. MEDICINE AND HYGIENE.—Electricity in Medicine.—Graphic presentation of what electricity is doing in medicine and surgery. 14302

VI. MINING ENGINEERING.—How Ore is Purchased.—The purchase of gold and silver ore.—The system of charging undesirable ingredients against the ore, and so reaching the net result of its value..... 14310

VII. NATURAL HISTORY.—The Common Pheasant.—The history of the introduction and increase of the pheasant in England.—An extraordinary instance of acclimatization of a foreign bird.—1 illustration..... 14306

VIII. RAILROAD ENGINEERING.—Railways of Great Altitude in the Andes.—Notes on the extraordinary railroad enterprises which have been carried on in South America.—Peculiarities of the conditions and methods of overcoming the difficulties.—3 illustrations..... 14300

The Jaffa and Jerusalem Railway.—Opening of the railroad to the city of Jerusalem.—View of the new station at Jerusalem and of the Baldwin American locomotive employed on the line.—A projected railroad to Damascus from the port of Haifa and Mohammedan sacrifices on inaugurating the line.—3 illustrations.... 14299

IX. SURGERY.—The Achievements of American Surgery.—By FREDERIC S. DENNIS.—Conclusion of this notable article, with numerous citations of the triumphs of American surgery and the causes for its wonderful progress..... 14308

X. TECHNOLOGY.—Cheap Carriages.—The possibility of making cheap carriages, with estimate of the possible cost of production. 14304

Church Incense.—By J. C. MCWALTER.—Notes on the manufacture of incense with formulæ for its production of different prices. 14304

Gas vs. Electricity for Illuminating Purposes.—An attempt to present the relative merits of gas and electricity so as to give an unbiased view of the advantages of each..... 14304

Silvering Glass Mirrors.—Practical notes on the silvering of astronomical specula.—Exact details of manipulation, with silvering formula..... 14304

The Manufacture of Liquors and Preserves.—By J. DE BREVANS.—The continuation of this treatise, giving the manufacture of different kinds of medicinal wines, and opening the subject of the clarification and preservation of liquors.—5 illustrations..... 14305

What Constitutes Good Vulcanized India Rubber.—Practical ests of the quality of vulcanized rubber as established for the use of the Russian government..... 14305

XI. VITICULTURE.—Black Rot of the Grape and How to Treat it.—The Bordeaux mixture of copper sulphate and lime.—Formula for its preparation, and the results achieved by it in overcoming the disease.—1 illustration..... 14307

THE TWO GREAT SHIP CANALS.

We give in another column an account, by an officer of the navy, of a recent visit to the Panama and the Nicaragua canal works. The descriptions given of the present condition of these great enterprises are especially interesting, coming as they do from the pen of a careful, disinterested observer. The U. S. S. Kearsarge, which conveyed our correspondent, lately reached Havana, from Greytown, Nicaragua.

THE BERLINER MICROPHONE PATENT.

The famous Bell telephone patent, to which the courts have awarded an unexampled scope, will on March 7, 1893, reach its last limit of life. The invention of the telephone, as far as covered by that patent, will after that day be public property. The claims of this patent, it will be remembered, were held by the courts to cover the use of the so-called undulatory current for telephoning. Next, in the practical application of this decision in numerous cases the courts held that no operative telephone was ever shown them which did not employ this current. Finally, no alleged anticipating device was ever allowed by the courts to show the transmission of articulate speech by an undulatory current of electricity. Sometimes it seemed as if the law was almost strained in this exclusion of prior devices. The old House telegraph patent showed a perfectly operative telephone, although the inventor had no idea that it could transmit articulate speech. The doctrine that a device when patented is patented for all possible uses was not allowed to apply to the anticipation of the Bell telephone. The courts seemed gradually to adopt the principle that the Bell telephone was entitled to the broadest possible scope. They protected it by their action as no patent has ever yet been protected. The public to a certain extent felt that special tribute was due to so wonderful an invention. Now the original patent lapses. Next year another fundamental patent expires, but the field is not yet to be open.

The Bell telephone, working by the currents induced by the motion of an armature in front of the poles of a magnet, is, when used as transmitter, of but little value. As a receiver it is of high utility. Right on its track came the microphone, which supplied the missing element. The microphone is an excellent transmitter, but is not a practical receiver. The two form a complete system, and all telephoning is now executed by the use in one circuit of both instruments.

The telephone used as transmitter is, properly speaking, a species of dynamo or generator. It produces electric impulses by the currents induced in a coil of wire surrounding a magnet coil. These currents are induced by the motions of a diaphragm of soft iron acting as armature of the magnet. The voice causes this to vibrate and so changes the field of force. Used as a receiver, the action is reversed. Varying currents passing through the coil throw the diaphragm into vibration. If these currents are of proper quality, articulate speech results.

The microphone operates by changing the resistance of the circuit. The apparatus includes in general terms two surfaces in contact. Against one of the contact pieces a diaphragm of iron rests. On speaking against the diaphragm it vibrates, alters the pressure between the contact pieces, and so changes the resistance. A battery being in the circuit, this causes changes in intensity of current, which operating on the telephone reproduce sound.

The fundamental microphone patents, which were applied for in the early days of telephony, and were granted to Blake and Edison, have all lapsed by the expiration of foreign patents. It would seem that this should end the *regime* of the telephone monopoly. But within the last few years a good deal has been published concerning an application for patent by Emil Berliner which dated back to 1877, which became the property of the Bell Telephone Co. in 1878, and which was very lately granted. By statutory action this application, it was alleged, was kept alive by the Bell Co. These assertions were confirmed on Nov. 17, 1891, when the Berliner patent was issued to Emil Berliner, assignor to the American Bell Telephone Co.

The patent shows and describes a microphone, such as might be used on a telephone circuit to-day. Aided by the apprenticeship of many years litigation, and by the many undulatory current decisions of the courts, six claims have been written for the patent, and have been allowed by the Patent Office. The first claim is for the method of producing in a circuit electrical undulations similar in form to sound waves by causing the sound waves to vary the pressure between electrodes in constant contact, so as to strengthen and weaken the contact, and thereby increase and diminish the resistance of the circuit.

This is the main claim of the patent. It covers the present form of transmitters. The only escape from it for any particular transmitter would seem to be in denying variation of pressure, and in holding that simple motion of the electrodes upon each other effects the result.

The other claims are for structures. They claim transmitters with vibrating plate and electrodes in constant contact. The force in law of this "constant contact" will be seen when it is noted that the telephone decisions have virtually been based on the assumed inability to telephone by the make and break current; the assertion that constant contact is essential to the transmission of speech by electricity has now the force of law.

Private corporations are very chary of attacking the Bell Telephone Co. The limitless pecuniary resources of the great company enable it to sustain litigation with great vigor. But in the matter of the Berliner patent the Federal authorities have taken the matter in hand. A brief has been filed in the United States Circuit Court by United States Attorney-General Miller, which marks the beginning of a proceeding to annul the patent. It is perfectly obvious that for the Patent Office to receive applications for two fundamental patents, to grant one of the patents outright and to permit the other application to be kept alive for fourteen years by dilatory motions is clearly inequitable. If the present law provides no way of preventing such proceedings, a new law should be enacted. On its face the Berliner patent continues the telephone monopoly up to 1908.

In his brief the Attorney-General holds that the Berliner patent, on various grounds, should be annulled. The delay of fourteen years in taking out the patent is alleged as contrary to equity and to the plain spirit and intent of the patent law. It is on such a ground as this that success in annulling the patent would be most acceptable. A decision to this effect would be a most valuable precedent. In this aspect the case seems to be a conflict between law and equity. Patent cases are tried in equity proceedings. It is to be hoped that the full powers of an equity tribunal will be exercised by the court.

Various other allegations are contained in the complaint. It is charged that the specifications and drawings were all struck out and new ones were substituted. The Patent Office objected to the turn the proceedings were taking, and eventually an affidavit by Berliner was filed, stating that the matter in the substituted application was invented by him prior to filing the original and formed part of that invention. The filing of the affidavit is claimed to be fraudulent and to give sufficient ground for annulling the patent.

Another very curious basis of attack is furnished by the Berliner patent of 1880. In this a microphone identical with the one of the 1891 patent is described, but although a microphone, it is claimed both as transmitter and receiver. This is cited as a prior patent, and seems to be for the same invention, and hence destroys the validity of the disputed patent. The law holds that two patents for the same invention cannot both be valid. One or the other patent must lapse.

The proceedings will be watched with much interest, as the points of law involved are very interesting. The case may lead to the enactment of new laws to prevent the recurrence of such proceedings as those complained of in this action.

Progress of Electric Railways.

We are now, says Mr. Bonnett, using much larger and heavier cars and more powerful motors, and the improvements due to the great advance of the electric power industry tend to increase the efficiency of the motors and gearing employed. The development of the low speed motor will lead to one in which, for ordinary speed of street traffic, the armature can be placed directly on the driving wheel, thus dispensing with all outside losses. When this result is arrived at, which time is not far off, and either a light storage battery or a practical system of power transmission to do away with overhead wires and their attendant damages is developed, the electric street car will stand at the head of methods of surface rapid transit. As an instance of modern practice, I would quote one of the St. Louis suburban electric roads where, with modern cars and equipment, a run of 8 miles out from the city is made in 30 minutes schedule time.

Probably the largest electric locomotives yet constructed are those now being built by the Thomson-Houston Company for the Baltimore and Ohio Railroad Company to transfer passenger and freight trains through the city of Baltimore. These motors have the armatures directly on the driving axles and at a speed of 30 miles per hour make about 170 revolutions per minute.

Their principal dimensions are as follows:

Diameter of driving wheels	5 feet.
Service speed	30 miles per hour.
Size of conductors	8 sq. in. cross section.
Transmission of power	overhead trolley.
Pressure of current	About 700 volts.
Current	1,500 to 2,000 volts per motor.
Weight of locomotive	90 tons.
Electric H. P. developed	1,500 H. P.
Drawbar pull	40,000 lb.

THE Victoria railroad bridge over the St. Lawrence at Montreal is two miles long, cost over $5,000,000, and contains 10,500 tons of iron and 3,000,000 cubic feet of masonry.

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[SPECIAL EDITORIAL CORRESPONDENCE OF THE SCIENTIFIC AMERICAN.]

Progress of the World's Columbian Exposition—Interesting Facts and Particulars.

When the World's Columbian Exposition is open to the public, visitors will find it difficult to realize what an active factor in completing the great Exposition women have been. From the inception of the Fair the rights of women to be represented have been fully recognized, and women have been regarded as part of the official organization, and not considered as a side show. Mrs. Potter Palmer, president of the board of lady managers, has now made a formal and official report to the board of control, in which she reviews the work done by the board of lady managers from its organization. Your correspondent has been permitted to see this report and make the following abstract:

The board of lady managers was formally organized on October 21, 1890, and Mrs. Potter Palmer chosen president. Rules and by-laws were adopted to govern the board, and a formal communication was sent to the executive committee stating the desires of the ladies as to what they considered best to do. Plans of work were immediately formulated and appropriations for a building for official and other purposes secured, and the plans of a Woman's Building, drawn by Miss Hayden, of Boston, accepted. The work of finishing and decorating the building was left to the board, and $6,000 was voted by the directors to be used for two large mural paintings for the tympans at the ends of the main gallery. These paintings are 14 feet high and 58 feet long, and their execution was awarded to Miss Casset and Mrs. MacMonnies. Since the building was completed the caryatides of Miss Yandell and the pediments and groups of Miss Ridout have been placed in position.

Women from various parts of the country and world have taken part in decorating the building. Cincinnati has donated wood carving and pottery, and furnished the main parlor. Other Ohio women have furnished and decorated a parlor. California women another room. Artists from New York furnish and decorate the library. Women from West Virginia, Kentucky and Texas have done much toward furnishing and decorating. Colorado women send Navajo blankets enough to cover the walls of the hall in which is the ethnological display. Iowa women furnish a corn palace. From the Illinois board comes $6,000 for the equipment and maintenance of an emergency hospital and exhibit of work of trained nurses. Women in France and Great Britain also have a share in decorating the building. Women from thirty-seven States, two Territories, Alaska, and the District of Columbia are interested in the work of the board of lady managers, while co-operation in the work is had by women in Italy, Germany, Austria, Russia, Algeria, Cape Colony, Cuba, Mexico, Nicaragua, Argentine Republic, Jamaica, Ceylon, and Brazil. Queen Margherita of Italy will send her choice collection of laces, containing specimens dating back 1000 B. C., while typical specimens of woman's handiwork will be exhibited from each of the countries named. Madam Diaz, of Mexico, will send an orchestra of Mexican girls in rich costumes, and they will play Mexican national airs.

The whole control and management of the Woman's Building is in the hands of women, as will also be the awarding of prizes.

Another important work that this board has undertaken is the building and maintaining of a children's building. The funds for this building and exhibit were raised by the women themselves. This will be primarily an educational exhibit. Provisions have also been made with ample facilities for caring for children while their mothers are visiting the exposition buildings. A complete list is now being compiled of the charitable, philanthropic, literary, artistic, and other organizations of women. A salesroom will also be established for the sale of woman's work of all kinds. Many exhibits will be made by women in the various State and other buildings. Another important part that women will play will be in the several congresses that are to be held. All the formal meetings of these congresses are to be held in the new permanent Art Building, now building on the lake front in the heart of the city, so it is understood, and women hold not only several congresses of their own, but also take important part in the proceedings of nearly all the congresses.

The number of fake schemes that are being worked in connection with the Exposition seems to be almost limitless, and their variety shows that a great amount of ingenuity is being expended in this direction. These schemes boldly proclaim themselves as "official." One direction in which much harm may be done by these fakirs is in the line of boarding and lodging directories and bureaus. As was stated in a recent letter, there is but one "official" bureau of public comfort, and that one is under the immediate management of the Exposition authorities. It is organized for the comfort of visitors, not for gain, and it has secured the handling of the most desirable rooms to be had in all parts of the city. Visitors are cautioned not to pay for rooms in advance, except through the advice of this bureau, because of the many fraudulent schemes which are flooding the country with enticing promises. The greatest trouble yet encountered by the Exposition authorities in connection with fake schemes has been in the matter of guides and catalogues. Any number of so-called "official" publications of this nature are being worked, much to the injury of the Exposition's legitimate publications, and more to the disgust of Chicago business men. The catalogue, for which a concession was recently granted and for which a bonus of $100,000 was put up, is permitted to take advertisements under limited conditions, and a host of advertising solicitors has been turned loose upon the advertising public all over the country. But prospects for the success of this part of the venture are not encouraging, as solicitors for the fake publications have already pretty thoroughly solicited the field of advertisers. Hardly work enough has been done on this official catalogue to make it worth mentioning, and unless exhibitors report promptly exactly as to the nature of their exhibits, the catalogue cannot possibly be completed until long after the exposition is opened.

It would appear as though coffee drinking were to be no unimportant feature of the Exposition, as a contract is just reported as closed for 700,000 pounds of coffee to be delivered as wanted for the restaurant service. In connection with this restaurant service it will be welcome news to intending visitors at the Fair to learn that all varieties of epicurean tastes and all sizes of purses are to be provided for. The company that holds the concession for the restaurant service announces that in all the important buildings will be restaurants where a wholesome lunch can be had at a counter for a small sum, or a somewhat more pretentious meal had for a somewhat larger price, while there will be more luxurious accommodations, where expensive meals as elaborate as first-class hotel service can be had with wines and other extras. The restaurant service as now planned has seating capacity for 15,000 people at a time.

Director-General Davis proposes to take steps to put an end to all attempts to get up a cholera scare in connection with the Exposition. To begin with, the drainage of the Fair grounds and the method of disposing of the sewage have been made as complete as possible—in fact, are among the most instructive of exhibits, and will be considered as important features of the Exposition. But with all this perfect outfit, Colonel Davis proposes to take no risks whatever, and he has just made an official report in which he recommends the appointment of a special corps of sanitary police of twenty-five or so men, who shall examine the entire sewerage and drainage system of the grounds twice a day and enforce rigid observance of the rules. In connection with the efforts of the Exposition authorities a citizens' committee and representatives of the city government are planning a rigorous campaign to clean the city. It is fortunate for the Exposition that the grounds are in one of the most healthy parts of the city and several miles from the most dangerous pest-breeding localities in case there were an epidemic. The present indications are that nothing will be left undone to provide every precaution for the health of the city next summer.

The damage wrought by snowslides on the roofs of the larger buildings amounts to a few thousand dollars, but makes no appreciable interference with the progress of installing exhibits. As soon as the present accumulations of snow on the roofs are disposed of, the damage can be readily repaired. The big slide on the roof of the Manufactures and Arts Building is supposed to have been started by the motion and jar caused by running a train of cars into the building. The snow had gone a distance of nearly one hundred feet before it reached the roof of the annex, and the momentum it had obtained was quite irresistible with such light work as the glass framework of the roof. The structural part of the roof was in no way injured.

A committee of insurance men has just made an official inspection of all the work done on the buildings and of the facilities at hand for fighting fire. The engineering department took the precaution at the inception of work to be in harmony with the insurance interests, and the work of construction, the installation of the electric plant and wiring and all other sources of possible danger have been carefully watched. This strictness has caused some differences with contractors, but in no respect whatever has work been intentionally slighted. In every instance the question has been security, not cheapness. The fire department has grown as work has progressed and now comprises three steam engines, four chemical engines, forty hose carts, with an abundance of hose, over 1,000 fire extinguishers, and a powerful fire tug. This tug was constructed with special reference to service on the lagoons. So far as water is concerned, the pumping facilities will be ample for a city of thousands of inhabitants when completed.

A dozen or two carriages have been doing a thriving business for several months in carrying visitors about the grounds. But these and all other vehicles are now shut out of the grounds, so that there shall be no hinderance from them to the rush of installing exhibits that is now so evident. The temporary drives that have been used by the carriages cross the railway tracks in several places and would interfere more or less with the running of trains. The many trucks which handle exhibits will now have full use of the driveways at each of the buildings. This order also prohibits visitors in the grounds from entering any of the buildings, both as a protection to exhibits and to prevent interference in the work of placing the exhibits.

The cold weather and heavy snow storms during the first half of the month very materially affected the progress of the work at the park. Very little out-door work could be done, and the force of men employed was less than 5,000. Many car loads of exhibits got delayed on the road, still further hampering progress. These belated exhibits are now coming into the park by trains, and the number of men employed is being rapidly increased. It is expected that they will aggregate about 15,000 men by March 1. A customs department has been established, with a force of inspectors that will soon aggregate 20 men.

An occasional threat comes from "organized labor" to boycott the Fair because it cannot dictate as to how things shall be run. Cigar makers are aggrieved because the authorities would not rule that only union-made cigars should be sold in the grounds. In this connection, it should be said that smoking will be closely restricted because of possible dangers by fire. Another threatened labor trouble has been with the painters. They are aggrieved because of the use of a small machine for painting. Two men, with one of these machines, can do as much work as 25 or 30 men with brushes. There are not painters enough in Chicago to complete the work without the use of these machines, so that the excuse for a strike is very slim.

Auditor Ackerman has made a statement of the finances of the Exposition, in which he shows that $14,593,317.14 have been spent. Of this amount, construction alone has cost $12,649,072.59. The expenses for the month of January were $1,131,284.30.

The work of construction is now practically done, except in the case of some minor structures. The great passenger station at the railway terminal still has much staff work to be done, as the intensely cold weather came at a time when this work was scarcely begun. The staff, however, has been made ready, and it is only a questton of two weeks or so in putting it in place. Music Hall is only in the frame as yet.

Dr. Norvin Green.

On February 12, at 7 A. M., Dr. Norvin Green, president of the Western Union Telegraph Company, died at his home in Louisville, Ky. He was born in New Albany, Indiana, April 17, 1818. Early in life he was taken by his parents to Kentucky. There he received his early education. In 1840 he graduated with honors from the University of Louisville, as a doctor of medicine. He soon became physician to the Western Military Academy, Drennon Springs, Ky. James G. Blaine was then one of the junior instructors there. For a number of terms he was a member of the State legislature, and in 1853 he was United States commissioner in charge of the construction of the national building in Louisville. While holding this position he became one of the lessees of the United Morse and People's Telegraph wires, connecting Louisville and New Orleans. The companies were united under the title of the Southwestern Telegraph Company. This marks the beginning of his connection with the telegraph interests of the country. In 1866, when the Western Union, United States, and American lines consolidated, he was chosen vice-president. With some intermission he held this and a similar position until on April 23, 1878, he was elected president of the Western Union Telegraph Company. This position he held to his death. He was a man of high executive ability, having the art of doing a great deal without exhausting himself under the great responsibilities of his position.

Esparto Grass.

Esparto grass has recently been recommended for introduction into the United States as a fiber plant. It is a native of Spain, Portugal, Greece, and Northern Africa, thriving upon sand and gravel in arid situations, and growing especially well on limestone and gypseous soils. It is not cut, but pulled, sometimes twice a year. It can be grown either from seeds or divisions of the roots. Ten tons of dry esparto, worth from $20 to $25 per ton, can, under favorable circumstances, be obtained from an acre. In Spain, where now the product amounts to from 70,000 to 80,000 tons annually, it formerly ran to waste or was used only as fuel. Now, such is the demand for it, that land considered valueless a few years ago is worth thousands of dollars. About 60,000 tons are sent to Great Britain annually from Spain. In the latter country it is used in the manufacture of ropes, baskets, sandals, matting, etc., while in England it is largely used in making ropes and paper. Good writing paper is made from it without the admixture of any other material, and the price of this paper varies from $200 to $250 per ton. There is certainly an opening in this country for some enterprising individuals to grow this grass.—*J. F. J.*

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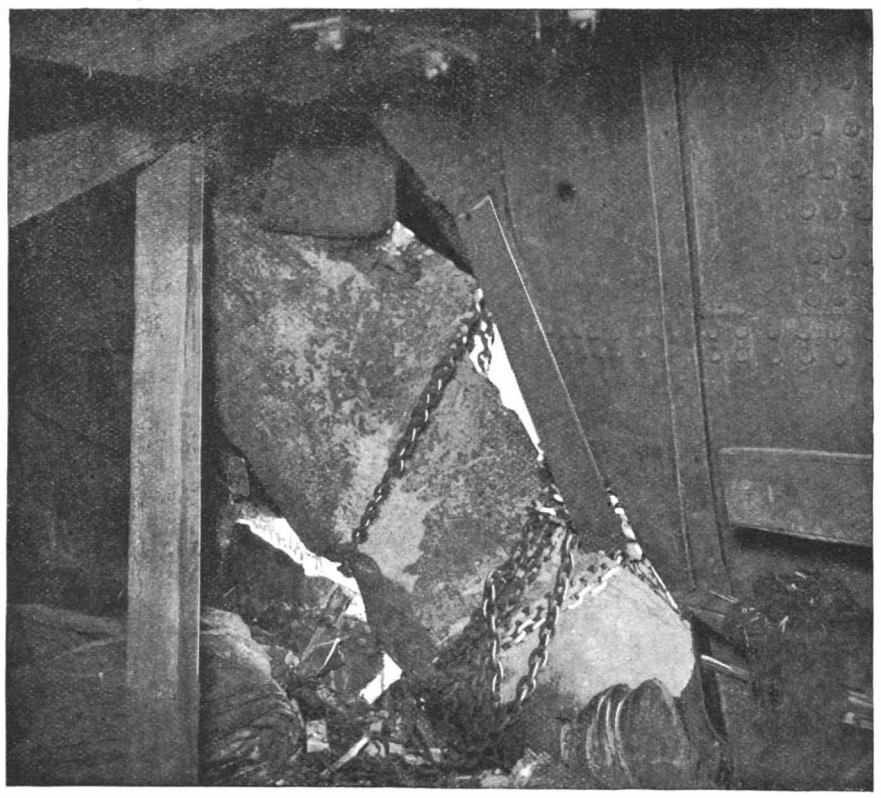
SINGULAR ACCCIDENT TO A STEAMER AT SEA.

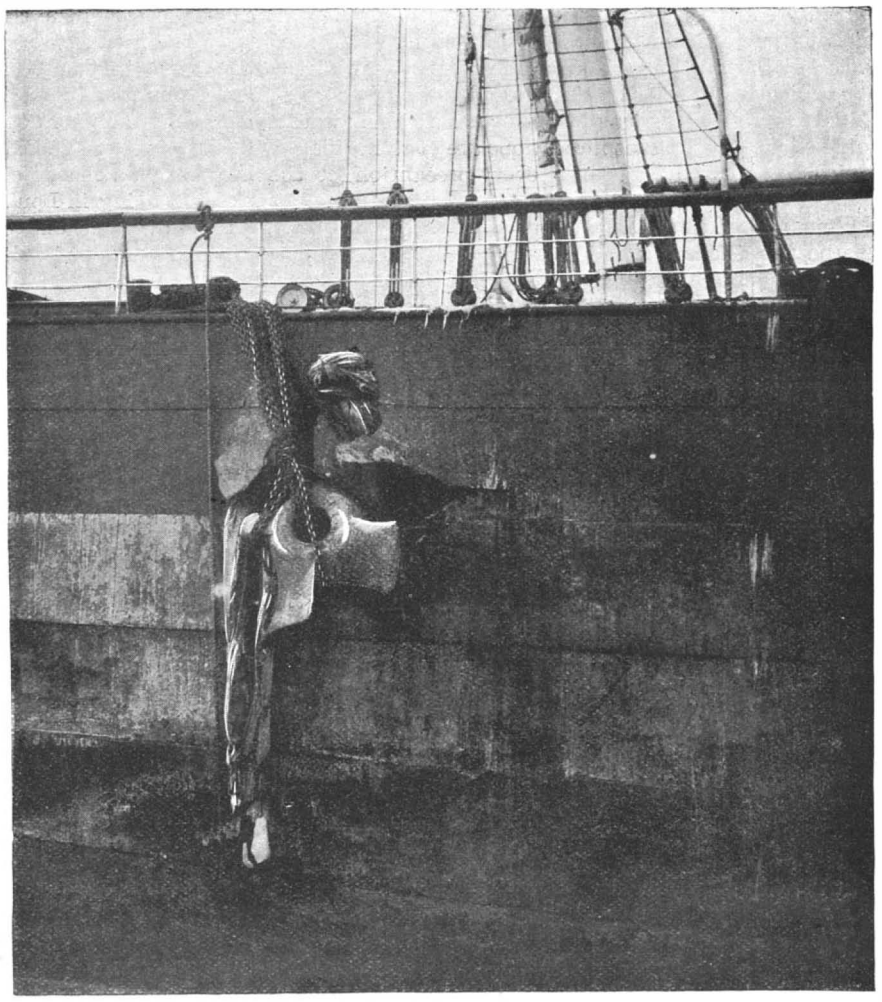
The steamship Elrie left St. Vincent, Cape Verde Islands, December 27, 1892, for this port. When in the Gulf Stream at 3 A. M., January 11, Captain Creeden was startled by a tremendous pounding between decks under after hatch No. 3. Upon investigation he found that the spare propeller had broken loose from its lashings, and was rolling from side to side, striking the sides of the vessel with great force, breaking two of its blades close to the hub. Striking the starboard with greater force than usual, it made a hole about six feet square, in which it stuck. The captain with his men quickly threw chains around it, and secured it there. In the mean time the propeller shaft threatened to break its lashings to the side of the vessel. Captain Creeden seized a scantling, and using it as a lever, held the shaft in place while his men lashed it firmly. Attention was then given to the broken blades, which were flying around like cannon balls. With difficulty they were lassoed with chains. When all was secured the holes in the sides of the vessel were stuffed with dunnage, and the vessel proceeded on her way to this port, which she reached January 17, 1893.

Propeller weighs about 12,000 pounds; width of blade, 3 feet 6 inches; length of blade, 7 feet; hub, 2 feet 8 inches thick; diameter of shaft, 16 inches.

Our illustrations are from photographs taken from the ship after her arrival at New York. One of our views shows the exterior of the side of the ship with the propeller projecting partly through the side of the vessel. The other is an interior view, between decks, showing the propeller as finally secured.



ACCIDENT TO THE STEAMER ELRIE—VIEW BETWEEN DECKS.



ACCIDENT TO THE STEAMER ELRIE—EXTERIOR VIEW.

Colorado Climates.

At the annual meeting of the Royal Meteorological Society, held recently in London, Dr. C. Theodore Williams, president, delivered an address on "The High Altitudes of Colorado and their Climates," which was illustrated by a number of lantern slides.

Dr. Williams first noticed the geography of the plateaux of these regions, culminating step by step in the heights of the Rocky Mountains, and described the lofty peaks, the great parks, the rugged and grand canyons, and the rolling prairie, dividing them into four classes of elevations between 5,000 feet and 14,500 feet above sea level. He then dwelt on the meteorology of each of these divisions, giving the rainfall and relative humidity, and accounting for its very small percentage by the moisture being condensed on the mountain ranges of the Sierras lying to the west of the Rockies, also noticing the amount of sunshine and of cloudless weather, the maxima and minima temperatures, the wind force, and the barometric pressure.

Dr. Williams quoted some striking examples of electrical phenomena witnessed on Pike's Peak (14,147 feet) by the observer of the United States Weather Bureau, when, during a violent thunderstorm, flashes of fire and loud reports, with heavy showers of sleet, surrounded the summit in all directions, and brilliant jets of flame of a rose-white color jumped from point to point on the electric wire, while the cups of the anemometer, which were revolving rapidly, appeared as one solid ring of fire, from which issued a loud rushing and hissing sound. During another storm the observer was lifted off his feet by the electric fluid, while the wristband of his woolen shirt, as soon as it became damp, formed a fiery ring around his arm. The climate of the parks is, however, Dr. Williams considered, of more practical interest, and in these magnificent basins of park like country interspersed with pines, and backed by gigantic mountains, are resorts replete with interest for the artist, the sportsman, the man of science, and the seeker for health. Most of them lie at heights of from 7,000 feet to 9,000 feet, and so good is the shelter that usually snow does not long remain on the ground; while Herefordshire cattle in excellent condition are able to fatten on the good herbage, and to lie out all the winter without shed or stable. Dr. Williams predicted for these parks a great future as high altitude sanitaria for the American continent, especially as several of them have been brought within easy distanee of Denver, the Queen City of the Plains, by various lines of railway. The resorts on the foothills and on the prairie plains, at elevations of 5,000 feet to 7,000, feet, include, besides Denver, Colorado Springs, Manitou, Boulder, Golden, and other health stations, which can be inhabited all the year round, and where most of the comforts and luxuries of American civilization are attainable in a climate where not more than half a day a week in winter is clouded over, where the rainfall is only about 14 inches annually, most of which falls during summer thunder storms, where the sun shines brightly for 330 days each year, and where the air is so transparent that objects 20 miles off appear close at hand, and high peaks are calculated to be visible at a distance of 120 miles. Dr. Williams summed up thus: The chief features of the climate of Colorado appear to be: 1. Diminished barometric pressure, owing to altitude, which throughout the greater part of the State does not fall below 5,000 feet. 2. Great atmospheric dryness, especially in winter and autumn, as shown by the small rainfall and low percentage of relative humidity. 3. Clearness of atmosphere and absence of fog or cloud. 4. Abundant sunshine all the year round, but especially in winter and autumn. 5. Marked diathermancy of atmosphere, producing an increase in the difference of sun and shade temperatures varying with the elevation in the proportion of 1 degree for every rise of 235 feet. 6. Considerable air movement, even in the middle of summer, which promotes evaporation and tempers the solar heat. 7. The presence of a large amount of atmospheric electricity. Thus the climate of this State is dry and sunny, with bracing and energizing qualities, permitting outdoor exercise all the year round, the favorable results of which may be seen in the large number of former consumptives whom it has rescued from the life of invalidism and converted into healthy, active workers, and its stimulating and exhilarating influence may also be traced in the wonderful enterprise and unceasing labor which the Colorado people have shown in developing the riches, agricultural and mineral, of their country.

Commitment of Lunatics.

Dr. Carlos F. Macdonald, State Commissioner in Lunacy, points out some popular errors in a recent letter to the New York *Times* bearing upon the commitment of an insane person to the Hudson River State Hospital, on an alleged false representation. He says among other things:

"It will be seen that under the present regulations it is practically impossible to secure the continuous detention in any institution for the insane in this State of any person who is not a fit and proper subject for commitment. Even in the Rappaport case, where it appears that the certifying physicians had failed to qualify with the commission, there was evidently no wrongful intent, the case being a proper one for commitment and the physicians having acted in entire good faith, but in ignorance of the law of 1889. In refutation of the popular delusion respecting the ease and frequency with which sane persons are committed to asylums for the insane, the assertion so often flippantly made that almost any two doctors can be induced for a consideration to certify to the insanity of a sane person, in order to enable his relatives to get him out of the way, does the medical profession a great injustice. During the more than twenty years that I have been professionally connected with hospitals for the insane, also in my official capacity as the medical member of the Commission in Lunacy, I have had occasion to examine thousands of cases in custody—either at the request of others who thought them sane, or frequently at the solicitation of patients themselves—and I have yet to find a single case of whose insanity I had any reasonable doubt, except in certain convalescent patients who were about ready to be discharged as recovered. I have, however, known of cases in which the commitment papers were defective, and also, though very rarely, instances of mistaken diagnosis, in which the delirium of fever, alcohol, etc., has been mistaken for insanity proper, and the case sent to an asylum. But, to the credit and honor of the medical profession be it said, I have yet to find an authenticated instance of a sane person being certified as insane, and incarcerated in an asylum through fraud, corrupt collusion, conspiracy, or wrongful intent on the part of medical men."

Artificial Maple Sugar.

Decoctions or extracts of the wood or bark of trees are frequently used for flavoring sirups or sugars. Different extracts differ in taste. The hickory tree it is said yields an extract that will impart the flavor of the maple, and Daily's method of producing artificial maple sirup or sugar is as follows:

Make an extract of hickory bark or wood by allowing water to percolate through the same. The bark or wood may be ground, or sawdust therefrom used. Hot water may be used, or the material boiled in water. The strength of the extract may be increased by increase of the quantity of the wood or bark.

To one gallon of hot or boiling sugar sirup add say three tablespoonfuls of the hickory extract. It is said the effect of the extract is to produce a flavor that renders the sirup indistinguishable from genuine maple sugar. If the sirup is boiled down, a sugar resembling maple sugar in taste is produced.

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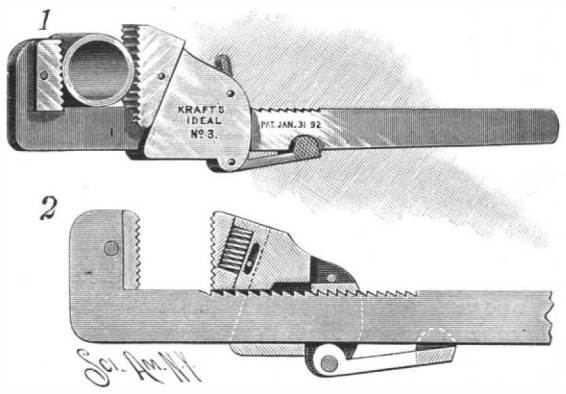
AN IMPROVED WRENCH.

The illustration represents a simple and durable wrench, patented by Mr. Charles H. F. Kraft, in which the jaws may be quickly and conveniently adjusted for different sized work. Fig. 1 shows the tool in perspective and Fig. 2 is a side sectional view. The fixed jaw on the outer end of the handle consists of a U-shaped removable piece held in position by a pin, and the movable jaw is mounted to slide on an inclined tongue of a head held longitudinally adjustable on the wrench handle, and adapted to be locked on it. The jaw is wedge-shaped, and in moving it in or out in its guideways it moves nearer to or farther from the fixed jaw.

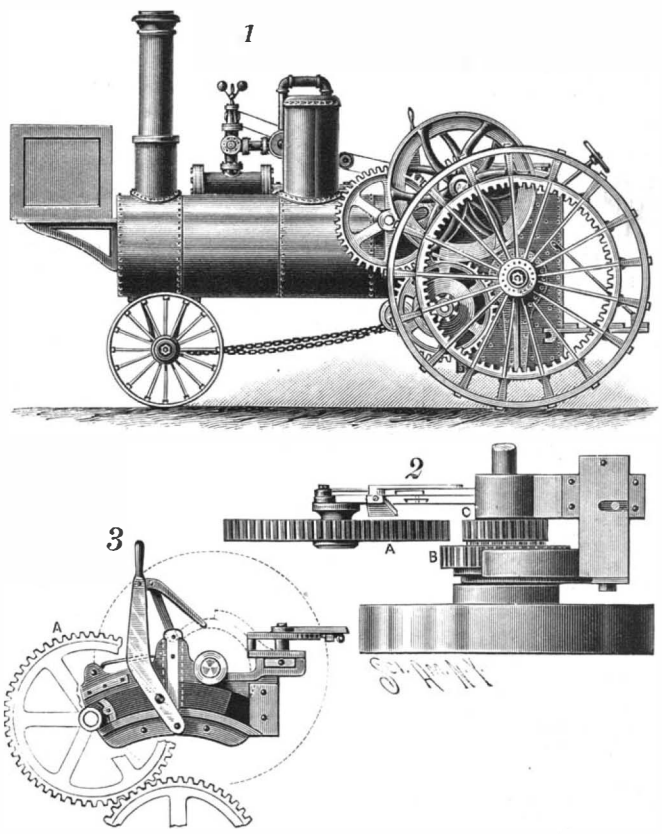


KRAFT'S WRENCH.

The movable jaw is held in place by a pin held transversely in its sides and engaging a slot in the tongue of the head. In the front face of the tongue of the head and in the under side of the jaw are recesses containing a spring to hold the jaw in an innermost position, as shown in Fig. 2. The movable head is locked in place on the handle by a toothed dog having a tongue engaging a slot in the lower end of the head, while on the opposite edge of the handle, is an eccentric cam mounted on a pin supported in lugs projecting from the head, and when the handle on the eccentric is swung away from the wrench handle, the head carrying the movable jaw can be readily moved along the handle. This wrench, while being a superior tool for pipe work, is also designed to have great efficiency for general use. The jaws being parallel allows it to grip any square nut or bolt head, and when once adjusted to the size required it cannot be changed by being moved on the bench. It is a strong wrench, and its quick and easy release from a pipe makes it very convenient in use. Further information relative to the improvement may be obtained of the Kraft Ideal Pipe Wrench Co., Battle Creek, Mich.

AN IMPROVED TRACTION ENGINE.

The machine shown in the illustration, patented by Mr. James A. Stout, can be propelled at a high or low rate of speed, and readily changed by the engineer from one speed to the other without removing or rearranging any of the parts. Fig. 1 shows the engine in perspective, Figs. 2 and 3 being partial plan and side views. On the main driving shaft is a small driving pinion, C, bolted to the hub of the belt pulley, and on the inner surface of the rim of the belt pulley acts a friction pulley having a hub turning loosely on the hub of the belt pulley. On the outside of the hub of the friction pulley, and secured by a key in a longitudinal keyway, is a second driving pinion, B, adapted to slide longitudinally on the hub, such movement being effected by a shifting segment by means of a handle in ready reach of the operator. The gear wheel, A, forming part of the gearing for the traction mechanism, is in alignment with the first small driving pinion, C, but is adapted to be engaged by the larger driving pinion, B, when the latter is shifted transversely. For this purpose the gear wheel, A, is mounted on a stud held on a bearing sliding in a segmental guideway formed on a pillow block, a pin on the bearing being connected with an upwardly extending lever, as shown in Fig. 3, by moving which the bearing can be shifted so that the gear wheel, A, is moved in or out of mesh with the small driving pinion, C. The gear wheel, A, does not move out of mesh with the traction gearing when the lever shifts the bearing, and the friction pulley in its normal position is always in contact with the belt pulley, being pressed thereon by springs in line with the driving shaft. When the engine is used as a power for thrashing machines, the belt can be readily tightened or loosened by running the traction engine a short distance forward or backward at a slow speed.



STOUT'S TRACTION ENGINE.

Further information relative to this improvement may be obtained of the Harrison Machine Works, Belleville, Ill.

The "New Mesmerism."

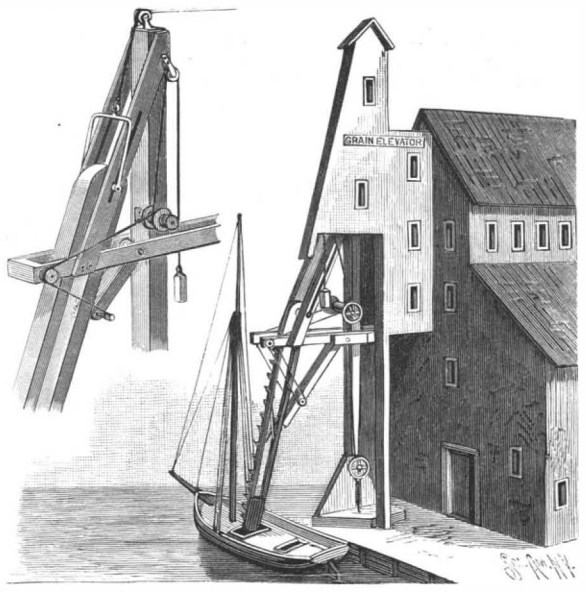
Within the past few months most wonderful tales have appeared from time to time in the daily press concerning certain mesmeric performances in the Paris hospitals. It was gravely stated that Dr. Luys, of La Charité Hospital, had obtained such a development of hypnotic suggestion as to bring about a transference of sensibility to inanimate objects. For example, a person in the hypnotic state would receive a suggestion that a glass of water was part of himself and was capable of sensation. Then the glass would be taken out of his sight, and when the contained water was agitated the patient would be visibly disturbed or even give evidence of acute suffering. Other inanimate objects were capable of receiving like impressions, and there was apparent danger that this "externalization of the sensations," as it was called, would come to be regarded as an accepted fact by not a few prominent scientific men with more imagination and credulity than sound common sense.

Mr. Ernest Hart, when in Paris recently, had his attention drawn to these seemingly astounding manifestations of occult force, and was so impressed with what he saw that he determined to seek out the cause. It took him but a very short time to see that the subjects of these hypnotic experiments were impudent impostors, and that Dr. Luys was the victim of gross fraud. He suggested to the doctor the employment of certain simple tests, such as the substitution of inert substances for the drugs in sealed tubes which were supposed to act upon the subjects when brought near the body. Dr. Luys, however, declined to act upon this suggestion, saying that he could perform the experiments only in his own way, and if they failed to convince he could only express his regret. Mr. Hart then procured the attendance of five of these subjects in his own apartments and repeated the experiments in the presence of a number of Parisian and foreign medical men. The same phenomena, he says, in a communication to the London *Times*, "were reproduced with sham magnets, with substituted figures, with misnamed medicinal substances, and with distilled water, and with sham 'suggestion,' opposite suggestion, or none at all. Every one was able to convince himself that all the results so shown were, without exception, simulated, fictitious, and fraudulent. That some of the patients were hypnotic and hysterical in a high degree does not alter the fact that from beginning to end they all showed themselves to be tricksters of the most barefaced kind; some of them very clever actors, possessing dramatic powers which might have been turned to better purposes, most of them utterly venal and some of them confessing that they played upon the credulity of Dr. Luys for their own purposes."

It is strange to think that men of scientific medical training can be so thoroughly duped in this closing decade of the nineteenth century, and we may well pause to ask ourselves whether, after all, the world is any less credulous than it was in the good old days of witchcraft and diabolism. There may be a greater number of hard-headed skeptics abroad, but a large portion of mankind is still hungry for the incomprehensible and the supernatural, and as religious faith wanes superstition seems but to take a firmer hold on certain minds.—*Medical Record.*

A SHIFTING DEVICE FOR ELEVATORS.

The illustration represents a device more especially designed for grain elevators used to load or unload vessels, being adapted to conveniently shift the elevator leg to hold it in contact with the grain. The improvement is in practical service in a Buffalo, N. Y., elevator, where it is said to be giving good satisfaction. It has been patented by Mr. James Flemming, of No. 290 Perry Street, Buffalo, N. Y. The elevator leg slides in a frame extending horizontally from a post, and on the upper end of the leg are trunnions which extend through slots in braces connecting the front end of the frame with the upper end of the post. The outer ends of the trunnions are engaged by a bail connected with a rope extending over a pulley, the rope being connected with a suitable device for pulling the leg up or letting it down. The back of the leg is supported by a friction roller journaled in the free end of a pusher arm pivoted on the frame, this arm being also connected with a rope extending forwardly and upwardly over a pulley in the outer end of the frame, thence to and around a drum turning on a stud on the vertical post, the rope then passing upward over a sheave, and supporting at its lower end a weight designed to counterbalance the weight of the elevator leg. At one end of the drum is a pulley over which passes an endless chain or rope, which passes also over a pulley provided with a hand wheel near the ground, and by manipulating this chain or rope the drum is turned to wind up or unwind the rope connected with the forward end of the pusher arm, giving the latter a forward or backward swinging motion, whereby the lower end of the leg can always be held in contact with the grain.



FLEMMING'S ELEVATOR SHIFTING DEVICE.

THE LOVELL DIAMOND CYCLE.

The new Lovell Diamond cycles, one of which is shown in the accompanying cut, are constructed much the same as the 1892 model, but with a few improvements, among which is a new Diamond frame of the Humber pattern. Lightness and strength are attained by the use of the best English seamless steel tubing, combined with American steel drop forgings. The patent adjustable ball bearings are supplied to all running parts, and are fitted to both wheels, crank shaft pedals and head. These bearings are constructed alike. The balls are adjusted by an adjustable cone on one side and a stationary cone on the other, the bearings adjusted by the former. Removable hardened steel ball cups and ball-retaining washers are used. A leading feature in these bearings is that, in the

THE LOVELL DIAMOND CYCLE.

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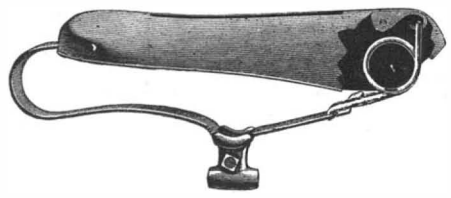
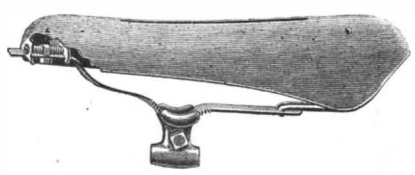
event of an accident, the cup can be replaced at a very small cost.

In the two small cuts we show a peculiar feature of construction of the saddle. By turning a screw at the end, any slack in the leather covering can be taken up at once. The other view shows how by turning a screw the position of the saddle can be in-



stantly changed on the bar, as well as the tilt of the saddle arranged to suit the rider.

The Lovell Diamond cycles have been in the market for several years. All the parts are thoroughly tested before entering into the machine and extreme care is taken in the fitting. The John P. Lovell Arms Co., of Boston, make a large variety of Diamond cycles suited



for ladies and children as well as gentlemen, and will be pleased to mail their new catalogue on application.

A Peculiar Fire.

In the *Ladies' Home Journal* for January is an account of a fire from gasoline that originated in a rather peculiar manner. A lady was cleaning a Brussels carpet with gasoline. She had cleaned about one-third of the carpet when she noticed one spot that looked a little dull and which must have a little more rubbing. She says, "I gave one quick, hard rub, the cloth in my hand ignited. There was a sort of a puff, and the flames went creeping all over the carpet I had cleaned." The explanation suggested was that the friction ignited the gasoline, but no suggestion is made as to whether that was caused by raising the temperature to a high degree, as might ordinarily happen by friction or whether it was otherwise.

Professor G. D. Shepardson, of the University of Minnesota, writing to *Science* in respect to the above, says: Some of my experience in the cold, dry climate of Minnesota has suggested a very plausible explanation for this accident, which seems surprising that such accidents are not more frequent. Our sleeping room has an ingrain carpet, from which we get marked electrical experiences. On a cold morning one can hardly take a step without being strongly electrified. By shuffling across the carpet, taking only two steps, I have many times drawn a spark one-eighth of an inch long. By taking a dozen shuffling steps and touching the water faucet I have several times drawn a spark nearly one-half of an inch long. Indeed it is so common and so excessive that it is quite uncomfortable. I have several times thought seriously of getting up some arrangement for gradually dissipating the charge on one's body, so that we can avoid the unpleasant shock when using the water. It should be stated that this high degree of electrification is not an everyday experience, but it is very common when the thermometer in the room goes below 50 or 40 degrees Fah.

A similar experience is very common here when one is putting on a fur overcoat or one simply with a fur collar. The simple rubbing of the fur in putting on the coat will so electrify it that one gets a prickly sensation from the charge from the collar when it is turned up against one's neck. Quite frequently simply picking up a flannel undergarment will so electrify it that one hears a decided crackling. These experiences are very common here in Minnesota with the dry atmosphere, and are quite surprising to one accustomed to the more moist climate of New York of the seacoast.

This experience suggests at once that the gasoline in the case above noted was ignited by an electric spark caused by rubbing the carpet.

An Unusual Foundry Experience.

A singular accident occurred recently in the foundry of the A. L. Swett Iron Works, Medina, N. Y., which seemed very mysterious.

Mr. Albert L. Swett, the proprietor of the works named, has a communication in the *American Machinist* relative to the matter.

We were melting a fifteen ton heat in a newly lined cupola, says Mr. Swett, and soon after the blast went on a number of our men were affected by gas. Out of about fifty employed in the room, seventeen were so overcome that it required prompt medical aid to restore them. They seemed to become paralyzed to a certain extent, and unable to help themselves. Some of them seemed to suffer intense agony, while others seemed more in a paralyzed condition. And from the statement of the doctors who handled the cases, it seemed to paralyze the lungs to such an extent that it was necessary to work rapidly in order to restore the action of the blood through the system. In about two hours or more, with the assistance of four physicians and what other help we could get, all were restored sufficiently to be taken to their homes, and the most severe cases were kept away from their work only four to five days.

As to what caused the gas to affect so many at this time is unaccountable. From actual experience of over twenty-five years in the business, I have never seen nor heard of anything like it before, and in conversation with old moulders they claim they never had. The moulding shop had been idle for two days. All ventilators were closed, and the gas, after putting on the blast, seemed to settle to the earth instead of going to the chimney. It was not our custom to open the ventilators until the room was warmed somewhat from the melted iron; doubtless the gas was all retained in the room.

What Constitutes Good Vulcanized India Rubber?

An investigation has recently been conducted by Lieut. L. Vladimiroff, at the St. Petersburg Technical Institute, with a view to establishing rules or tests whereby the quality of vulcanized India rubber may be efficiently judged. It is a notorious fact that no method of chemical analysis gives reliable results for this substance. Hence the tests applied were chiefly of a physical nature. From a lengthy series of experiments the following conclusions were deduced, namely:

1. India rubber should not give the least sign of superficial cracking when bent to an angle of 180° after five hours of exposure in a closed air bath to a temperature of 125° Centigrade. The test pieces should be 6 centimeters thick.

2. Rubber that does not contain more than half its weight of metallic oxides should stretch to five times its length without breaking.

3. Caoutchouc, free from all foreign matter except the sulphur used in vulcanizing it, should stretch at least seven times its length before rupture.

4. The extension measured immediately after rupture has taken place should not exceed 12 per cent of the original length of the test piece of rubber. The test piece should be from 3 to 12 millimeters long, 3 centimeters wide, and not more than 6 millimeters thick.

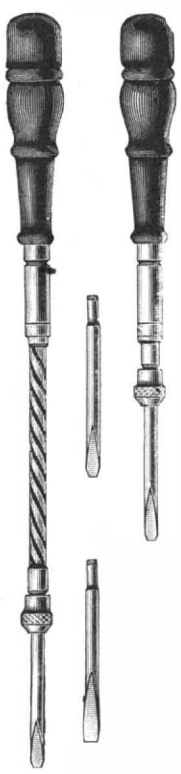
5. Softness may be determined by measuring the percentage of ash formed on incineration; it may form the basis for deciding between different grades of rubber for certain purposes.

6. The vulcanized rubber should not harden under the influence of cold temperature.

These conclusions are to serve in the establishment of rules governing the introduction of vulcanized rubber in the Russian navy.—*The Electrician.*

A LABOR-SAVING SCREW DRIVER.

The "Howard-Allard" spiral, clutch, triple bit screw driver has recently been offered to the trade in new designs, though retaining all the original valuable features of the old Allard. This tool is especially adapted for light and rapid work, and is invaluable for mechanics having large quantities of small screws to drive. There is no turning of the hand and twisting of the wrist to drive a screw, which is effected by simply pushing the handle. The tool may be used as a spiral, ratchet, or ordinary screw driver. If it is found that a screw cannot be driven to its place by use of the spiral, it is readily done by using it as a ratchet or ordinary screw driver. It is provided with three bits nicely finished, of different sizes, to enable the operator to select one to fit any size screw he may wish to use. These bits can be instantly interchanged and secured in the chuck or clutch provided for the purpose. The knurled nut of the clutch is made of steel, and the socket of steel, as is also the spindle, which is provided with four spiral grooves, which are cut deep and have square sides, and which nicely fit corresponding grooves in the extra long nut through which it passes into the handle. This gives it nearly four times the bearing surface to wear usually found in this class of tools, which have fewer spiral grooves and shorter nuts. The handle is made of thoroughly seasoned hard wood, nicely finished. The whole tool is not only attractive, but also very strong and durable.



This implement is manufactured solely for the Alford & Berkele Co., 77 Chambers Street, New York City.

King Steam.

According to *Wieck's Illustrirte Gewerbeblatt*, the steam power at the disposal of the civilized nations was, in 1888, as follows:

	Horse powers.	Horse powers per 100 inhabitants.
Great Britain	8,200,000	25
France	4,520,000	11
German Empire	6,200,000	13
Russia	2,240,000	3
Austria	2,150,000	5
Italy	830,000	3
Spain	740,000	4
Portugal	80,000	2
Sweden	300,000	7
Norway	180,000	9
Denmark	150,000	8
Holland	340 000	8
Belgium	810,000	14
Switzerland	290,000	10
Other European countries	600,000	6
United States of N. A.	14,400,000	24
Colonies	7,120,000	—

According to the above table there were, in 1888, a total of 50,015,000 horse powers at the disposal of the civilized nations. The steam horse power is considered equal to three animal horse powers, and the latter to seven man powers. Hence every round million of horse powers represents not less than a thousand millions of man powers. Now, if we suppose a horse power to work, on an average, as long as a man, 1,000 millions of "man powers" are equal to 1,000 million men.

However, the civilized nations have only during the last few decennials come into the possession of these thousand millions auxiliary workmen. Although the steam engine was invented in the last century, there were, in 1840, only 1,650,000 steam horse powers in the same territory which now has over 50 millions at its disposal. Even in 1860 there were not more than 9,380,000 steam horse powers.

Now, as regards the distribution of the steam horse powers over the different countries, Great Britain leads with 25 horse powers per every 100 inhabitants, but is closely followed by the United States, with 24 horse powers per every 100 inhabitants. Next of importance, as industrial countries, are Belgium and Germany, then France and Switzerland, which are followed by the Scandinavian countries and Holland. By way of Austria are reached the countries of inferior industrial importance, of which Spain is the most prominent, while Italy ranks with Russia. However, it would be wrong to think of the greater portion of the above mentioned horse powers as being used for actually "industrial" purposes. Of the 50 millions steam horse power, only 10 millions belong to "stationary" steam engines, the remainder being divided between railroads (32 millions) and steamboats (8 millions). Hence, of the 1,000 millions auxiliary workmen who, in the form of steam engines, to-day perform service for us, not less than 800 millions are especially employed in the carrying of passengers and goods, and only 200 millions remain for industrial and agricultural purposes. It is estimated that, in 1888, the railroads of the world transported 1,430 millions tons, while 146,400,000 tons were carried by vessels, including both steam and sailing vessels. Among the articles transported by sea, coal, with 26·2 per cent, occupies the first place. Next follows wood, with 17·3 per cent; then grain, with 9·3 per cent. All other articles are of comparatively smaller importance, iron forming only 3·2 per cent of the entire transport; fabrics for clothing, 2·1 per cent; sugar, 1·8 per cent; and cotton, 1 per cent.

Radiation Through Vacua.

The experiments of Professor Dewar upon the effect of high vacua on the radiation of heat, undertaken in the course of his researches with liquid oxygen, lead to some interesting considerations that may cause us to modify entirely our conception of radiation of the sun's heat. It has been usually taken that the long heat waves, as well the short light waves, came direct by radiation from the sun, and that consequently an enormous amount of energy was continually being dissipated. But Professor Dewar's experiment tends to show that an absolute vacuum is entirely impervious to low waves of heat radiation. Interstellar space, therefore, though transparent to light radiation, does not presumably convey heat radiation at all, and the heat waves manifest in the atmosphere are created there. We see in this the necessity for remodeling our theories upon the time required to cool the earth down; for, if space is impervious to heat radiation—as is Professor Dewar's vacuum—we need not fear cooling on this account. The interstellar space has lost one of its properties, and at a stroke, by a simple experiment, a huge proportion of the supposed available energy of the solar system disappears.

TUNNELING THE SIMPLON.—Work on the new Simplon tunnel has been commenced. When completed it will be the longest tunnel in the world. It will extend from Brieg, in Switzerland, to Isella, in Italy, and its total length will be 12½ miles. It is expected that from eight to nine years will be occupied in the construction of the tunnel.

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NEW METHOD OF GAS SUPPLY FOR NEW YORK CITY.

The city of New York, at the present time, is supplied with gas from works situated within its limits, not merely inside of the corporate lines, but in close proximity to the most thickly settled districts. In old times, when gas was made from bituminous coal, and of course on a far smaller scale than at present, gas works gave but little annoyance to those living near them. Almost the only source of annoyance was the disposal of the foul lime from the purifiers.

The increase in extent of the petroleum industry has brought about the introduction, on an enormous scale, of naphtha into the gas manufacturing industry. At the present time not far from 1,000,000 barrels measurement of naphtha are delivered in this city annually. The use of such large quantities of naphtha not only involves production of more or less disagreeable odors, but is attended by great danger of conflagration, whatever precautions are taken. There is always a chance of the naphtha breaking loose, and if it once catches fire, there is no telling where the damage will end. The naphtha tanks are generally situated close to the river fronts, so that the escaping fluid might find its way to the river, and, if so, by burning and floating, would carry the flames far and wide.

At present there are three companies in practical operation supplying the city with gas. The great consolidation brought about some years ago omitted one company, and since then a second has been put in operation, thus completing the three.

We illustrate in this issue the work that is now being carried on with a view to the introduction of gas into the city from across the East River. The East River Gas Company is a corporation that possesses rights of the most liberal description. Its charter authorizes it to make and supply gas and electric power, and to condemn property if necessary for its purposes, with full power to lay pipes throughout the city. It also is organized to consolidate or purchase the property of present gas companies. Its present works are in Long Island City, opposite 71st Street, New York. They have hitherto comprised a small Low gas plant, which is at present manufacturing and supplying gas to the district and its vicinity.

Plans have been made for the construction of an enormous plant for carrying out the Low process under the methods of the United States Gas Improvement Company. These plans provide for a works of a capacity of 24,000,000 cubic feet per day. Work is at present in progress on what may be termed a 6,000,000 cubic feet block of these works. A three-lift gas holder of 650,000 cubic feet capacity is now in process of erection. The old holder capacity is 200,000 cubic feet. Contracts for a four-lift holder of either 3,500,000 or 4,000,000 cubic feet capacity will be awarded at once. The company own in fee simple an area of 250,000 square feet and they hold an option on several acres additional. Land in their vicinity is so cheap that they are virtually unrestricted in their powers of expansion. In this city, for the purpose of carrying out their work, they have purchased seven lots at the foot of 71st Street. By May 1st the new plant will be making gas for local supply.

The gas is to reach New York by a tunnel under the East River, to the details of whose construction our illustrations are more particularly devoted. It runs in a straight line across the East River from the foot of 71st Street to the site of the works on the banks of the East River, nearly opposite thereto. In its course it goes under Blackwell's Island. The rock penetrated has been exceedingly solid, consisting of gneiss, of a most excellent description for tunneling.

The section of the tunnel shows a straight-sided structure 8 feet high and 10 feet in diameter, with arched roof, whose general contour is shown with dimensions quoted. The tunnel is to accommodate three lines of cast iron pipe, one of 48 inches and two of 36 inches each, arranged as shown. Taking the length of the tunnel as 2,400 feet, this, by the ordinary approximate rules of the gas engineer, gives a carrying capacity of 286,000 cubic feet per hour at ½ inch pressure.

Our sectional illustration of the tunnel route gives an excellent idea of the general distribution and level thereof. The drainage, it will be seen, runs all to one end, where a sump is placed to collect any inflowing water. But the use of the tunnel is not only for three lines of gas mains. The company have already been offered $10,000 a year, for a period of twenty years, for the privilege of a pneumatic tube. It is also among the immediate possibilities that the East River Gas Company may, in accordance with its charter, develop into a great generating company for gas and power of all kinds, notably for illuminating gas and electric power. The immediate idea is, if possible, to sell gas to existing companies in the city or to acquire the property of those companies. The effects of such operations would be that the storage and use of naphtha within the city limits would be stopped. This in itself is a consideration of great importance.

The city gas companies own a great quantity of real estate. All of this now used by the gas generating works could be sold. As it happens, this part of the property is the most valuable, as it fronts on the water, and the less valuable portion of the property, remote from the water front and containing the gas holders alone, would have to be retained. The concentration of gas manufacture in a single place would, of course, cheapen its production by reducing the salary list. The proximity of the works to the works of the Standard Oil Company enables them to receive their naphtha by a pipe line, and presumably to make very advantageous terms for its supply.

The Panama and Nicaragua Canals.

While the papers have been publishing full accounts of the Panama Canal scandal, and friends at home have been suffering from the bitter cold weather, we have been visiting the Panama Canal and also the Nicaragua Canal and have been uncomfortably warm.

Landing at Aspinwall, or Colon as it is more frequently called, one finds more activity than was to be expected under the present state of affairs. The sun beats down with never-ending energy, and the frightful heat is only partially relieved by the cooling effect of the northeast trade wind.

The influence of this wind is felt only in the northern end of the town, and is completely lost on arriving at the central and southern portions of the level plain on which the city is built.

Work on the canal being at a standstill, the city derives little support from it. Most of the inhabitants get their living by handling the freight that arrives here for shipment across the isthmus to Panama and the return freight. The railroad connecting Colon and Panama is running, but not with the energy it had when work on the canal was in progress. There is but one passenger train per day, and few are the freight trains.

Colon has been twice nearly destroyed by fire, and these fires have had a cleansing and improving effect. The city is cleaner, healthier, better built, and in every way more habitable than formerly, and a citizen remarked that he thought it would be a good thing if the city would burn down about once in five years. There is no street-cleaning commission and no health board, and little is done to *keep* the health of the people. The arrangements for the care of the sick, however, seem to be very complete. The railroad company has a well-built, well-equipped, and well-managed hospital in the healthiest and most salubrious place on the north shore.

All along the route of the canal quiet reigns. A few years ago there was no Sunday there, but now every day seems a Sunday. It is not true, however, as some would have us believe, that everything has been neglected and allowed to go the dogs. Allowances must be made for the effects of climate and the peculiar condition of affairs, and when that is done it is surprising how successfully cared for have been the houses, the machinery, the boats, and in fact the entire plant of the canal company. To be sure, one sees much rusty iron, but the important machinery is protected and preserved by careful keepers or watchmen in the employ of the canal company. The tow boats, launches, lighters, etc., are housed in and protected from the weather, their machinery white-leaded and oiled, and periodically overhauled, turned over, and kept in such good order that I doubt not that ninety per cent of these boats could be put into service inside of a week. The houses are in good condition, though the hot and damp atmosphere has caused the usual decay of wood work, notably of the porches and exposed parts. The excavated portions of the canal are filling in, but not to an extraordinary degree. The heavy fall of water during the rainy season has washed down the banks and there have been numerous land slides, but not even to the extent that was expected by the projecting engineers. The receiver in whose hands the canal property now rests is expending about thirty-five thousand dollars a month in preserving the plant. Much interest is manifested by all classes at Colon in the development of the Paris scandals. The Colombians believe in the ultimate success of the canal, and, as they derive a large revenue from the building of the canal and from those employed by the canal company, they are anxious to have work recommence, and it is safe to say that the government authorities of the republic of Colombia will do everything in their power to help the canal company to its feet. It will be some time before the fate of the Panama Canal is decided. In case work is resumed, it will be on the plan of a lock canal.

The original plan was a failure because of inadequate knowledge of the country, incomplete surveys, wrong estimates and ruinous sub-contracts, and last, but not least, corruption.

The engineering difficulties of the new plan may be mentioned as the Culebra cut, the Gamboa dam and the control of the Chagres River. The most important one of the above is the dam, which is to contain 3,000,000 cubic yards of filling.

Those in position to know, and well-informed men generally, place the probable cost of completion at not less than $125,000,000 and the time at not less than seven years.

Leaving Colon, a couple of days' sail put us at Greytown, Nicaragua, the eastern terminus of the Nicaragua Canal. The advantages claimed for this canal over its rival at Panama are, first, the greater ease of construction; second, its more northern position; and third, the climate and prevailing winds are more favorable. The mechanical details are simpler and its position makes a material saving in distance between New York and San Francisco.

A great deal has been said about the harbor of Greytown being better than that at Colon or Panama. On visiting these places one fails to find it true. It is true, however, that Greytown *has* had a fine large harbor, but the sea has built a ridge of sand which incloses the harbor, thus forming a large lagoon. A pier or breakwater has been built, running out normal to the coast, and to the westward a channel or entrance to the lagoon has been dredged. The breakwater is now about one thousand feet long and is composed of creosoted piles. This, however, is only a framework, temporary on account of the destructive *teredo*, and is to be filled in with natural and artificial rock, part of which is already in place. To the eastward of the pier the shore line has made out about seven hundred feet. The channel to the westward does not get as much scouring out as was hoped for. There is ordinarily about eight feet of water on the bar. The breakwater will probably have to be continually extended, and constant dredging will be necessary to keep the entrance to the harbor in passable shape.

Work was commenced on the Nicaragua route about five years ago, and the progress has been good. Necessary buildings have been built in the most economical style, stores for material established, machine shops started, dredges, tow boats, and barges bought and put to work, and a short line of railroad constructed.

On a hand car we took a run over the railroad, which is now nine miles long. One is struck with wonder while looking at this piece of work, and cannot help admiring the pluck and perseverance of the builders. The road runs parallel and close to the canal line. It runs through a swamp land, and, when they started to build it, there was nothing but a dense forest of trees and undergrowth, the ground being covered to a depth of four or five feet with stagnant water, saturated with decayed vegetation. Men stood in this water up to their shoulders and laboriously chopped and felled the trees. Many of these trees were of wood as hard and unimpressionable as iron. A strip of swamp land was cleared to a width of about eighty feet and for a distance of six miles. The trees were trimmed and then formed into a cribwork along the line of the road, and on this cribwork stringers, ties, and rails were laid. Sand from the dredges was dumped on this, packing down through and around the timber, thus forming an embankment. Where the embankment sank down into the mire of the swamp, more timber and sand was added. Thus was made the roadbed that many engineers said was impossible of construction. The cost was forty per cent less per mile than the original estimate. This road is to be used in transmitting material, tools, equipments, etc., to different points along the line of the canal.

The two large dredges, the City of Paris and the City of New York, have started on the work of dredging, and have cut since January, 1891, a channel 1,500 feet long, 280 feet wide, and 20 feet deep. The track of the canal has been cleared of trees and underbrush for eleven miles. The manner in which one of these dredges eats into the earth is astonishing, and perhaps the reader can form an idea when I say that in each minute fourteen buckets full are scooped out, each bucket holding a cubic meter. Imagine a block of earth nearly as large as the room in which you are sitting being removed in a minute, and then imagine that operation being repeated every moment of the day and night.

A telegraph line has been constructed, so that there is communication all along the line of the canal, through to Brito, on the Pacific coast.

The total length of the canal route is 169·5 miles, of which 142 miles are free river and lake navigation. Lake Nicaragua, the highest level, is 110 feet above tide water.

Estimates made by reliable disinterested men and engineers put the cost of completing the Nicaragua Canal at $100,000,000. The route has been very thoroughly surveyed, and the above estimate is thus based on comparatively reliable data.

The present outlook for the completion of the Nicaragua Canal is far better than for the Panama, but they both seem to be hipped in the same way. It is simply a question as to which company can first get the necessary funds. F. R. BRAINARD, U. S. Navy.

Elixir of Cascara Sagrada.

Dujardin-Beaumetz (*Gaz. Gynecologique*) recommends the following as a remedy for constipation: Fluid extract of cascara sagrada, 90 gm.; pure glycerine, 90 gm.; alcohol of 90 per cent, 200 gm.; simple sirup, 400 gm.; oil of orange, 6 drops; oil of cinnamon, 2 drops; and sufficient distilled water for 1 liter. Dose —a wineglassful after meals.—*Am. Pharm. Jour.*

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DISTRIBUTION OF HOT WATER AT PARIS.

The distribution of cold water to houses in large cities has now become a necessity. How convenient and even useful would it not be to have hot water also under the same conditions. We have constant need of it for many purposes. In certain cities of the United States it is distributed by pipes, and perhaps it will be so distributed in France some day, but up to the present there has been no question of it. In the meanwhile, a company has just installed in Paris a series of small structures similar to newspaper kiosks (Fig. 1), where, for a cent, one can at once procure from 8 to 10 quarts of water at a temperature of 60 or 80 degrees. These apparatus are automatic. The customer has only to place a coin in a slot and then push a button, when the flow will begin. How this is done we shall endeavor to explain by means of the details in Fig. 2.

The water is not, as might be supposed, heated in advance and kept in this state in a reservoir, but is heated at the moment that it flows, and the apparatus is connected with the city mains that lead the water through the conduit, A, to the meter, O. Thence it is led by the tube, *a*, to a bifurcation, *b*. Through one of the branches, E, it enters a reservoir, R, provided with an outlet, *h*, and a float valve, *m*, limits its entrance. Through the other branch, F, controlled by a cock, *r*, it reaches the apparatus, CC, seen at the upper part of the figure. It is here that it is heated in traversing a copper coil 328 feet in length, under which burns a row of gas jets supplied by a pipe, U, that starts from a meter, G.

It is clear that the flow of the water, like that of the gas, is arrested while nothing is being drawn from the apparatus, which consumes only when it produces.

Let us now examine its working. It is set in operation by a pressure upon the button, B, represented apart upon a larger scale at the top of the engraving (Fig. 1). This button is connected with a rod which presents a gap that is filled by the coin that has been introduced into the slot, M. Before the coin is introduced the rod meets only with empty space, and the machine does not operate; but as soon as this space is filled, a second rod, *t* (Fig. 2), forming a continuation of the first, is likewise pushed and lifts a valve, S, which closes the orifice of a siphon, *i*, through which the water of the reservoir, R, flows to the exterior. This water flows rapidly into a funnel, D, mounted upon a lever and balanced by a counterpoise, *p*. As soon as it enters, it destroys the equilibrium in favor of the funnel, and the lever tilts and carries along the rod, *f*, which opens the cock, *r*, and permits the water to enter the copper coil. Herein it is immediately heated and escapes through the pipe, P, which extends to the exterior, and under which is the customer's receptacle. The funnel, D, has a nozzle provided with a cock, and the opening is so calculated that it shall take about a minute to empty itself, the length of time necessary for the passage of 8 or 10 quarts of water into the coil. As soon as it is empty the counterpoise, *p*, lifts the rod, *f*, and closes the cock, *r*. Then everything stops.

We have said that the row of gas jets burns only at the moment desired. In fact, the pipe that supplies it traverses a box, V, with a valve, and it is the pressure of the water that opens the latter as soon as the cock, *r*, is itself open. A small gas jet, *x*, which is constantly burning, lights the row of burners. As for the coin, as soon as the pressure exerted upon the button is sufficient, it comes opposite a slot, whither it has been pushed by a spring, H, and falls into a box. The rod and the valve, as well as the button, resume their position and all is arranged for a second operation.

It will be seen that this system, which was devised by Mr. Robin, is most ingenious. It will render many services to the Parisian population. A cent is a small affair, but if one has not always need of 10 quarts of water he can make an agreement with a neighbor to divide, and each put in in his turn the coin necessary to set the apparatus in operation. In its concession to the company, the city stipulates that it shall rapidly supply the carriage stations. In this way, the coachmen will be able, very easily and at slight expense, to renew the water of their foot warmers. It will be possible then to forbid the use of charcoal heaters, which have several times occasioned accidents. The laboring classes especially will very quickly see the advantages that they can derive from the hot water fountain. The copper coil that we have spoken of above is nothing else than a boiler of great heating surface. It is applicable to domestic uses, and Mr. Robin has for several years been constructing models which are adapted, in apartments, to the delivery pipes of the city water. This arrangement is very convenient for hair dressing saloons, bath halls, etc. It suffices to turn the supply cock by hand in order to obtain hot and even boiling water in an instant. A varying degree of heat may be easily obtained by regulating the velocity of the flow. It will be understood, in fact, that the more rapidly the water circulates in the coil, the less it becomes heated, and reciprocally. As for the operation of the system, that is the same as that which we have described above. There is a small burner always lighted, and it is the difference of pressure of the water at the moment that it flows that opens the gas inlet. If the apparatus has not to be used often, one can extinguish the burner and do the lighting by hand, either with a flame or electrically.—*La Nature.*

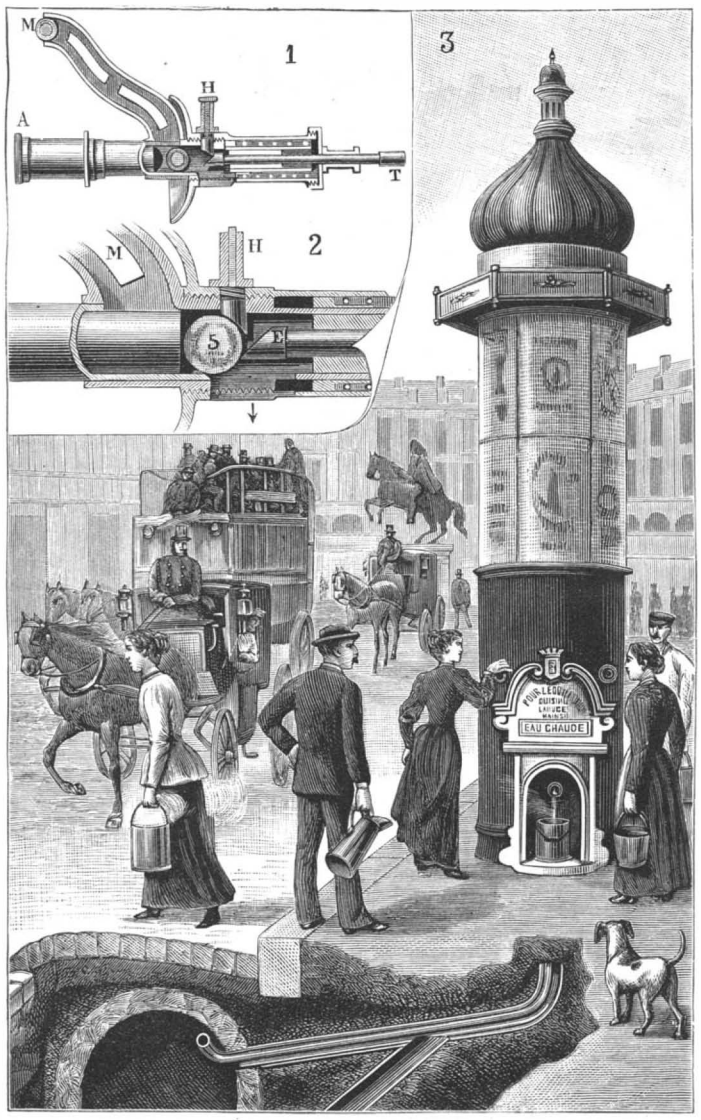

Fig. 1.—A PENNY-IN-THE-SLOT HOT WATER DISTRIBUTER AT PARIS.

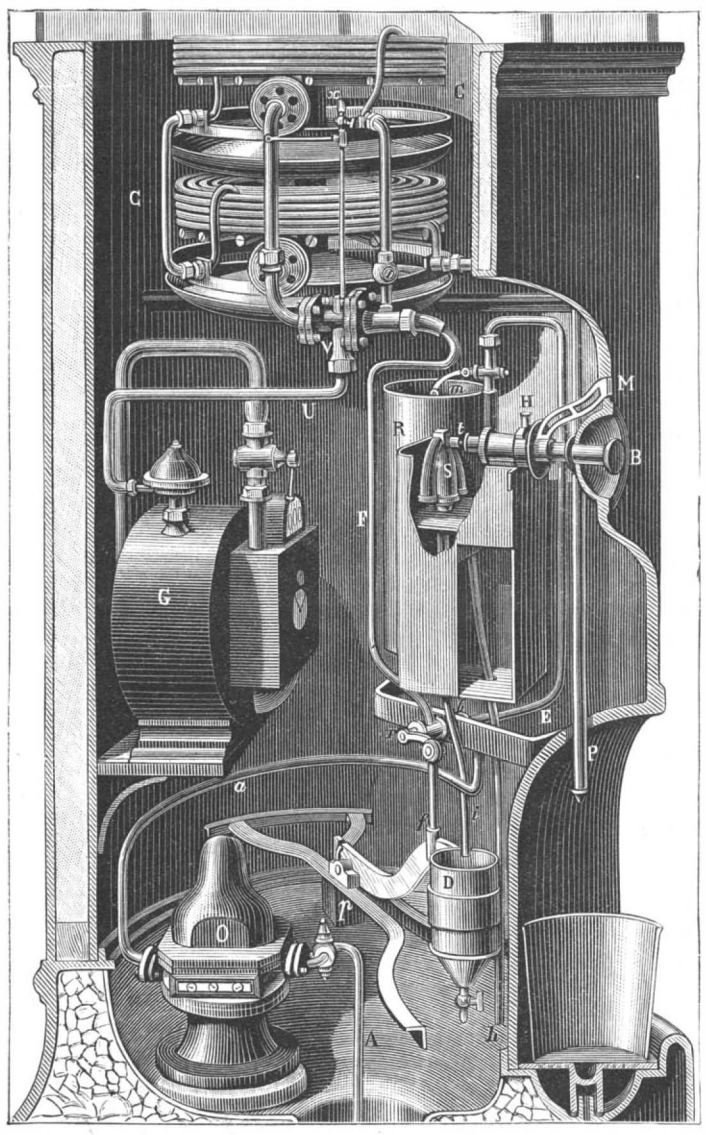

Fig. 2.—DETAILS OF THE MECHANISM.

How Modern Cremation is Conducted.

Miss Mary B. Comyns, of Boston, a member of the Massachusetts Cremation Society, has issued "A Plea for Cremation," in which the ceremony of incineration is described as follows:

"The body, simply clad and placed in a coffin, is not put into the fire, as many persons suppose, but into a so-called chamber of clay, little larger than itself, which is wholly closed except for a few small perforations in the top, for the escape of the gases, which are conducted through the fire and consumed. This chamber is heated to a temperature of about 2,000 degrees. Nothing but heated air touches the body. It lies absolutely undisturbed, maintaining its perfect shape until the last moment, when the beautiful rosy color it has gradually assumed changes to white, and it instantly falls together in the form of pure ashes. Sad, yes, heartbreaking it would be to watch the process, because anything which takes from us forever the forms of those we love is sad and heartbreaking; but, when our dear ones have been buried, is there ever a moment during those years and years of terrible changes through which they pass, when we could bring ourselves to look upon them?

"The crematory which contains the heated chamber may be as beautiful as money and refined taste can make it. The room in which the religious services are held may be as quiet and peaceful as the chapels in our cemeteries. As the service is solemn and reverential, so is there neither carelessness nor levity when the body is removed to its final resting place. All is tenderly done for the moment, and we know that no harm can ever again come to the forms of those we have loved. Is it so with inhumation?"

Boric Acid in Beer.

On the evidence of J. Brand, boric acid should be regarded as a normal constituent of beer. He has detected borates in the ash of Munich, other Bavarian, German, Austrian, and Brazilian beers, by the turmeric paper test, applied both to the ash itself and to the product obtained by distilling the ash with methyl alcohol and sulphuric acid, after Gooch. A search for the source of the boric acid resulted in the discovery that every variety of hops examined contained boric acid, not only in the strobiles, but in leaves, stalks, and tendrils. Barley and malt were found to be entirely free from this acid. No attempt appears to have been made at quantitative determinations; 100 cubic centimeters of beer sufficed for the detection of the boric acid and 5 grammes of hops always gave a certain reaction. It is a pity that such an excellent indication of the presence of genuine hop bitters in beer should be of a nature so easily imitated by the brewer.—*Zeits. fur das ges. Braw.*

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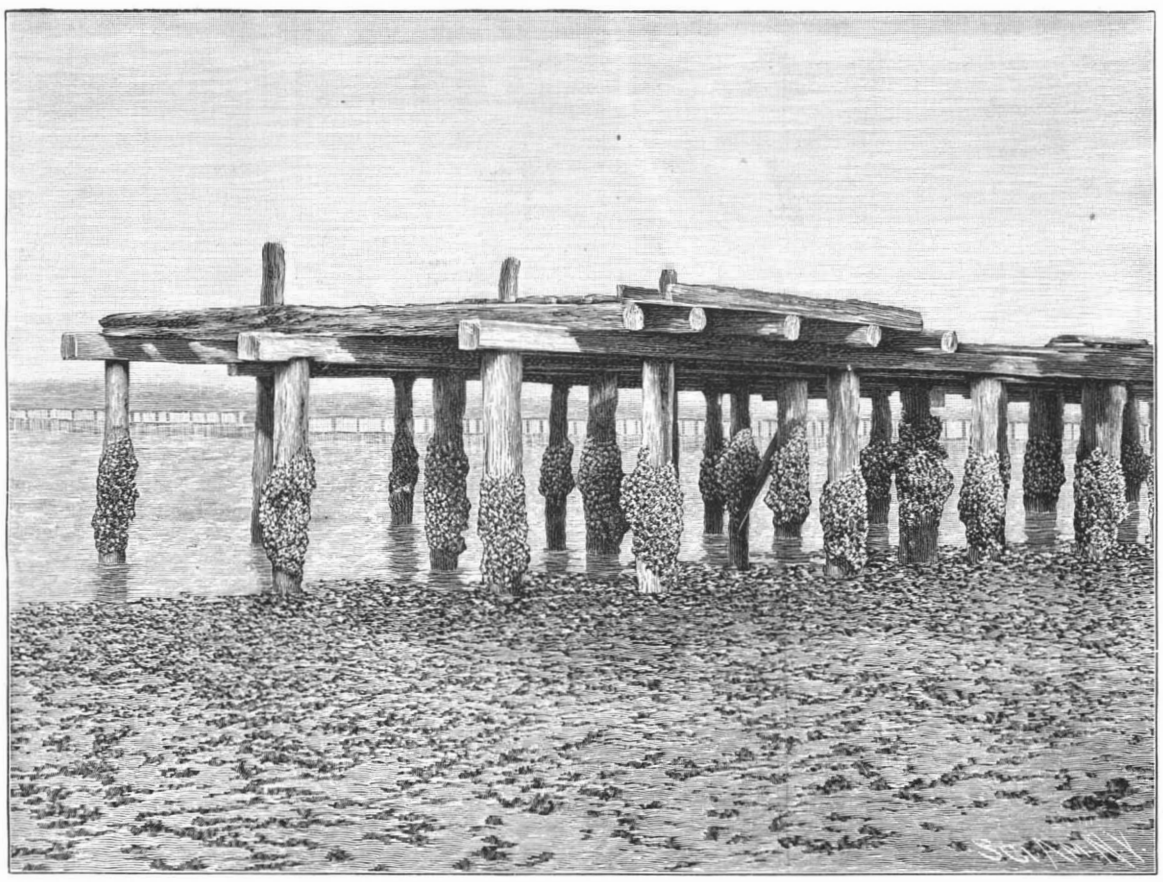
NATURAL OYSTER GROUNDS OF SOUTH CAROLINA.

Mr. Bashford Dean, a specialist in regard to oyster culture, and at present engaged in the biological department of Columbia College, is the author of a report, recently published by the U. S. Fish Commission, on the natural oyster grounds of South Carolina, pointing out the advantages offered by the State for successful oyster culture. It is based upon observations made from December, 1890, to March, 1891. The entire coast margin of the State, excepting the immediate ocean shores, is shown to be well provided with natural beds, but they differ strangely from the beds occurring further northward, since they skirt the shore in the fringing tidal reefs in such manner that the oysters live as much of their life in air as in water. At low tide the oyster ledges appear like hedges of frosted herbage, branching clusters or clumps of oysters being so densely packed together that individuals become modified or distorted according to their position on the cluster. The individuals that cap the cluster, projecting upward like flat-tipped fingers, have given them the local name of "raccoons," and these raccoon ledges, as they are called, form vast oyster flats, sometimes miles in extent, but the oysters are never found below the low-water mark except as they have fallen from the neighboring ledges. Our illustration shows the zone for the attachment of these oysters between the levels of high and low water upon stakes and piling everywhere, as represented by a photograph taken March 12, 1891. The maximum size and abundance of the oysters is midway between the tide marks.



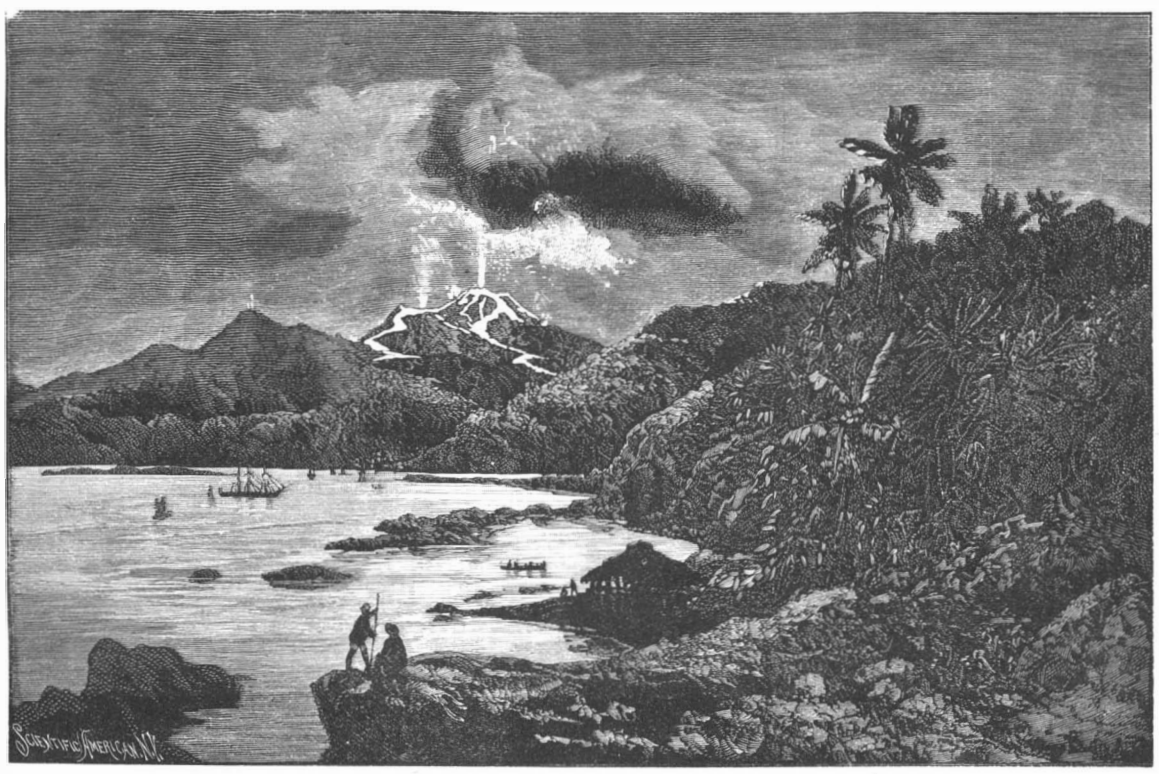
TIDAL ZONE OF OYSTER DISTRIBUTION IN SOUTH CAROLINA, INDICATED UPON PILING OF WHARF.

As a simple method of oyster culture, to transmute the tasteless raccoon into a table oyster, it is suggested that the raccoons, raked from ledges, be scattered in marginal waters about a fathom deep, where the bottom is suitably firm, when the time required for the raccoons to acquire the features of single oysters will vary according to season and locality, the period of conditioning being shortened by separating the clustered oysters before planting. The table oysters of the State, in many instances especially well flavored, are said to be almost entirely of this character.

THE VOLCANO MAUNA LOA.

A new interest attaches to this great volcano since the island in which it is situated is now likely to become practically one of our possessions. All of the twelve islands of the group are of volcanic origin, and are entirely composed of the products of eruption, although volcanic forces are still in operation in the island of Hawaii only. Mauna Loa is 13,760 feet high, and it has slight eruptions, or displays some form of activity, almost every year. There have been several years in which the eruptions were remarkably violent, viz., in 1851, 1855, 1859, 1868, 1881, and in 1887. In the latter year the first eruptions took place in January, when great streams of fiery lava, mixed with smoke and gases, rushed out of a newly opened crater, and during thirty-six hours there was an almost unceasing series of earthquakes, accompanied by tidal waves that were very destructive of life and property alongshore. The lava did not flow over the brim of the crater, but seemed to make its way downward by underground passages or through clefts in the mountain side, forming new reservoirs out of which the overflow cleft opened, which proceeded up the mountain in zigzag fashion to the crater Mokuaweoweo, the chief seat of the lava manufacture. For twelve days it sent down its river of fire fully 20 miles in length. The picture presented to the spectator at the spot was most remarkable—the snow-capped mountain discharging its glowing flood, at its foot the blue Pacific Ocean, with its world of islands. Fifteen pillars of flame shot up from the crater to a height from 150 feet to 200 feet, while lower down the other lava reservoir sent up columns over 40 feet high. The crater at the top of the lava river was about 40 feet or 50 feet across, and it was sometimes girdled by a sort of nimbus of fire.

"In the 53 hours between 2 P. M. on January 16 and 7 P. M. on January 18, 618 distinct shocks of earthquake were noted. The lava stream was much more copious and energetic than in 1868. Then it was accompanied by an incessant rain of ashes, which covered the land for miles around; but this time it was clear, thick lava. The upper portion of the mountain seemed for miles wide to be a sea of fire, which swept away in its course great blocks of stone. Owing to the rapid development of the eruption immediately after the series of subterranean shocks, the island escaped the horrors of a regular earthquake, and the mischief was confined to great destruction of the plantations. Several days after the first outflow of lava (which lasted a fortnight) a fresh outburst occurred about 1,000 feet below the Mokuaweoweo, and a new outflow established itself, following the direction of the stream of 1859, when the discharge continued with little interruption for 15 months. Explosions were being frequently heard, caused, no doubt, by expanding gases, which were followed by the projection into the air of columns of fire to a height of 500 feet."



THE 1887 ERUPTION OF MAUNA LOA, HAWAIIAN ISLANDS.

Cobalt Plating.

The cobalt for plating is now bought up in bulk by two or three chemical manufacturers, and is almost entirely used at present for blue coloring of glass and pottery and blue glaze. Its cost in reality is not more than that of nickel, but it is retailed at something about five times this cost. If cobalt plating, as suggested by Dr. Silvanus Thompson, were to come in, cobalt, being used more largely, would soon become as cheap as nickel. The process was patented, but the patent has now dropped through, and is therefore open to the world. The chief ingredient of the most practical process is Epsom salts, through which the silvery metal is deposited. The polishing is done with scratch brushes, and the resultant white coating is almost indestructible by damp or smoky air. Cobalt plating, in place of nickel, should be invaluable.

The Electric Lighting of Rome.

One can hardly imagine, says the *American Architect*, what Julius Cæsar, or, let us say, Cato the Censor, would have said, if he had read in the Sibylline books that a company of Scythians would, two thousand years after his death, install an apparatus through which the streets of Rome would be illuminated every night by a cascade at Tibur, twenty miles off in the Alban Hills; yet that is just what has come to pass. Several years ago an Italian company undertook the utilization of the Tibur, or Tivoli, water power, by means of turbine wheels and dynamos, for the purpose of lighting the little town of Tivoli. Soon afterward, the establishment passing under the control of the Roman Gas Company, the plant was increased, until it now collects and transmits a force of twenty-seven hundred horse power, and wires have extended to Rome. The experiment proved so successful that it has now been determined to utilize the whole available force of the cascade, amounting to about five thousand horse power, and the contract has been intrusted to a firm in Buda-Pesth, Hungary. The current will be transmitted, at a pressure of fifty-one hundred volts, through copper cables, protected with special care, as they must cross the desolate Campagna, and would otherwise be at the mercy of brigands. The cables enter Rome at the Porta Pia, where the current is converted by thirty-two transformers into one of two thousand volts, this being the pressure for which the city system of electric lighting is designed. In the city itself preparations are being made for increasing greatly the lighting plant. In place of two hundred and fifty arc lamps, the present number, six hundred will be installed, and the system, when complete, will be the most important example of transmission of electric force in the world.

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Correspondence.

The Bicycle.

To the Editor of the Scientific American:

I have often wondered why some of the manufacturers don't make one for older riders or ones too heavy to be athletic enough for the common safety bicycle. Why can't one be made with two rear wheels, about five or six inches apart, with the sprocket wheel and chain between them? The crank shaft would not need to be much longer than the regular safety, and the power would be applied directly in the middle, instead of one side, as in the safety. J.

Ceylon Vipers.

To the Editor of the Scientific American:

Order *Ophidia* and sub-order *Viperiform.*

We are thus introduced to the serpents whose lethal power is next to that of the cobra.

Sub-order viperiform is subdivided into two families:

1. *Viperidae*, with *two genera.*
2. *Crotalidae*, with *four genera.*

In this article I propose to speak only of the *Viperidae.*

The general characteristics of the vipers are:

(*a*) Short, thick bodies and wedge-like tails.

(*b*) Diamond markings.

(*c*) Laterally protruding cheeks.

The poison of vipers has been found to be charged with *venom globulin*, which produces fluidity of the blood and thus destructive hemorrhages. Also a general paralysis attends the introduction of viperine poison to the system.

It is primarily *local*, in distinction from cobra poison, which at once attacks nerve centers.

Antidotal Treatment.—Tourniquet, incision, and cauterization. Potassium permanganate (ammonia and alcohol) internally.

INDIAN.

Genera.—First, Scientific.

(*a*) *Daboia Russelli.*—2½ to 4 feet in length. Color, dark to light brown, in diamonds and marbled markings. Viviparous. 3 to 6 inches circumference. Fatally venomous.

(*b*) *Echis carinata.*—20 to 25 inches by 3 inches circumference. Color grayish-brown, and marked with quadrangular spots, white, edged with chocolate.

Scales are *keeled.* Hence the name—*carinata.*

A viviparous, vicious viper, active and offensive.

Venom—globulinic, like daboian.

Second, Local Genera.

In Ceylon the natives distinguish five varieties of vipers:

1. *Blood Viper.*—3 feet long, and marked with dark green diamonds.
2. *Black and White Viper.*—2 to 2½ feet. A common variety.
3. *Brown Viper.*—3 to 4 feet. Large and sluggish.
4. *Tumefacient Viper.*
5. *Grass Adder.*—2½ feet.

I have killed specimens of 1, 2, and 3 in Ceylon.

W. D. MARSH.

Amherst, Mass.

Wire Shafts for Steamers.

To the Editor of the Scientific American:

In view of the frequent and especially the several quite recent instances of the breakage of steamship shafts, it may be of interest to the general public, particularly to sea-going travelers, to know the results of some experiments recently made with an elastic shaft constructed of steel wires of small diameter, massed and bound together so as to secure all required strength, and to possess elasticity, both torsional and transverse, to a degree not possible in a rigid shaft.

Rigid shafts are broken, mainly because it is not possible to maintain exact and true lines of shaft bearings in ships of great length, and frequently because of undiscoverable flaws and imperfections in the shaft metal. Ships bend when sailing in rough and boisterous seas, and variations of atmospheric and water temperature expand and contract the metal of the hull, causing powerful bending strains which crystallize the metal of the shaft, weaken and ultimately destroy its vitality, until rupture and possibly serious disaster is realized.

In the construction of a wire shaft, every part, from the center to the circumference, comes under the observation of the expert in charge.

The experiments referred to show that when the shaft is in position, and when rotating stress is applied, a tensile force is exerted upon the individual wires and their several fastenings. Each is a unit of strength and sustains its pro rata of the total amount of stress. The law of action and reaction determines the amount. It cannot be greater than the available power of the engines of the ship in any given case.

The strength of the individual wires and of the fastening being known, it is practicable to ascertain the potential strength of the shaft as a whole. Suppose it to be made in five sections, its total length one hundred feet, and its diameter fifteen inches. The shaft will have twenty-five thousand No. 7 steel wires, each twenty feet long, with their fifty thousand fastenings. Each wire and each fastening will sustain a load of five hundred pounds without rupture or injury, making a total inherent strength of 37,500,000 pounds, twenty-five times greater in amount than the continuous force of an engine of 5,000 horse power. A stress of twenty-five pounds only upon each unit of strength, each point of resistance existing in a wire shaft as named, will more than equal the force of such an engine.

The wires of each section are welded together at their ends, making a solid mass of steel upon which couplings are fixed for bolting the several sections together. The spaces between the couplings are inclosed in short metal bands holding the body of the wires of each section in their normal cylindrical form, at the same time permitting a transverse elastic or bending movement when the ship bends, also elasticity of torsion when powerful waves strike the propeller wheel, lessening, or altogether eliminating all risk of injury to the crank and engines.

An additional inherent element of strength becomes active when torsional stress is applied to the shaft, viz., the friction of the individual wires pressing one upon another. The greater the stress, the greater will be the amount of friction.

If built with reasonable care and skill, such a shaft cannot be broken in any emergency or under the severest conditions.

The cost of building a wire shaft will also be very much less than that of a rigid shaft.

SAMUEL P. JEROME.

New York, February 17, 1893.

Recent Decisions Relating to Patents.

PATENTABILITY.

Letters patent No. 272,554, issued February 20, 1883, to Tom L. Johnson for a street railroad rail, combining the principal features of the tram and T-rails, but with a different disposition of metal and combination of parts, so as to allow the advantage of even fish plating, are void for want of patentable invention, as the change in form was merely the result of mechanical skill. 1.

Letters patent No. 340,135, issued April 20, 1886, to Howard T. Marshall for improvements in boots and shoes designed more particularly for playing lawn tennis, claim substantially (1) a continuous rubber sole with projections at the heel and tread, all moulded from a single blank; and (2) the same features, with the addition that the projections shall be conoidal and arranged in regular order. The Circuit Court holds that the improvement is of a trivial and unpatentable character. 2.

Letters patent No. 307,049, granted October 21, 1884, to John Hunt for an improvement in pneumatic conductors for elevator signals, are invalid, for there is no patentable novelty in inclosing a number of rubber tubes, each individually communicating with the signal mechanism in an elevator and with one of the floors of a building, in a jacket to keep them from kinking, stretching, and breaking, when wires used for electric signaling in elevators had been inclosed in the same way, and for the same purposes, and tubes had previously been used for operating the signaling mechanism in elevators. 3.

INFRINGEMENT.

The Circuit Court decides that in letters patent No. 167,400, issued September 7, 1875, to James P. Gordon for an improvement in packers for shutting off water from oil wells, consisting of (1) a tubular casing, (2) an expansible packer and cone for expanding it, and (3) a set of slips or wedge arms, and a wedge cone to force the arms against the wall of the well, to form a resistance base to the packer, so that when the casing is moved lengthwise the cone within the packer will expand it, the third element is novel, and is the basis of the entire device, and the patent is infringed by a device making use of the same idea by mechanical equivalents, their position merely being reversed, although in such device the wedge arms, besides serving to place the packer in position, as in the combination patented, have the additional function of aiding in sustaining the casing. 4.

Claim 1 of letters patent No. 397,766, issued February 12, 1889, to Lyman W. Welch for a folding bed, covers a combination whereby the head of the bed is carried in suspension by means of cords running over pulleys attached to the upright casing, each cord being fastened at one end to a lever crank, which is pivoted to the bed rail and attached at its lower end to a rod running to the leg of the bed, whereby the legs are folded downward as the bed is raised, the head of the bed meanwhile swinging inward and downward as the frame is folded up. The Circuit Court rules that, as this method of transmitting an eccentric motion to the legs is common in the arts, and as there is little novelty in suspending instead of supporting the head of the bed, the claim must be strictly limited to the combination in detail, and is not infringed by a bed which is supported at the head by rods fastened at their upper ends to the upright casings, pivoted below to the bed rail, and projecting downward and connected at their lower ends to the legs of the bed, so that the resultant motion is like that described in the patent. 5.

The Circuit Court of Appeals lays it down that letters patent No. 330,916, issued November 24, 1885, to Albert Northrop for an improvement in metallic ceilings, if valid at all, must, in view of the prior state of the art, be limited to a ceiling made of panels, in which the chief characteristics are (1) the formation on two or more sides of the panels, by means of moulded edges which fit into each other, of a channel along which leakage water may flow and be discharged at orifices made by cutting away the corners of the panels, the orifices being concealed by rosettes so constructed as to aid in discharging the water; and (2) the widening of alternate sides of each panel into flanged edges, which lie loosely upon each other, so as to allow expansion and contraction by heat and cold; and hence it is not infringed by ceilings made of metallic panels generally having partially raised surfaces surrounded by mouldings gradually flattening out into flat edges, which are nailed rigidly to the furring strips, such mouldings forming no continuous channel for the discharge of water, and each panel having rosettes at the corners, which serve the purpose of ornaments only. 6.

In letters patent No. 230,590, issued July 27, 1886, to George F. Pinkham, as assignee of Jacob P. Tirrell, the claim is for, "in an electric lighting gas burner, a magnet for turning the gas cock by one electric impulse, combined with a fixed electrode, *a'*, and a movable electrode, *c'*, normally in contact, and mechanism connecting the armature with the movable electrode, to break the contact between *a'* and *c'* the instant after the gas is turned on, and create a spark for ignition, substantially as described." It is held by the Circuit Court of Appeals that a mechanism otherwise substantially the same as the one patented is none the less an infringement because it has a horizontal armature, which moves in a vertical direction, while the patented apparatus has a vertical armature which moves in a horizontal direction. 7.

Letters patent No. 205,816, issued July 9, 1878, to Henry Tibbe, claiming "a smoking pipe made of corncob, in which the interstices are filled with a plastic, self-hardening cement," are not limited to the use of plaster of Paris for the filling material, and it is an infringement to use either a mixture of finely pulverized corncob mixed with cornstarch, and moistened in the act of putting on by saturating the cob in alcohol, or a mixture of pulverized corncob and shellac. 8.

Letters patent No. 188,079, issued March 6, 1877, to Henry W. Smith, for an improvement in sheet metal roofing, comprises a means for making a watertight joint, and for securing the sheets firmly to the roof boards by means of an anchor piece of sheet metal, rectangular in form and bent at right angles, so that when one part is nailed to the roof the other stands upright. The adjoining sheets of roofing have upright flanges of unequal height, the anchor piece being between them. The vertical portion of the anchor piece is split centrally, and one leg is folded down over the shorter flange. On the higher flange a hem is turned down so as to embrace the top of the other leg, and then these parts are folded down over the shorter flange and anchor piece, thus completing a joint of six or seven thicknesses of metal. The Circuit Court decides that the patent is infringed by the device made under letters patent No. 403,844, issued May 21, 1889, in which a tongue is punched out of the central portion of the anchor and bent over in such manner as to embrace the lower flange, while the entire top of the anchor is embraced by the hem of the higher flange, and is then folded over the lower flange. 9.

1. Johnson Co. *v.* Pacific Rolling Mills Co., 51 Federal Reporter, 762.
2. Marshall *v.* Packard, 51 Federal Reporter, 755.
3. Hunt *v.* Garsed, 51 Federal Reporter, 678.
4. Masseth *v.* Palm, 51 Federal Reporter, 824.
5. Standard Folding Bed Co. *v.* Osgood, 51 Federal Reporter, 675.
6. Northrop's Ex'ers *v.* Rasner, 51 Federal Reporter, 685.
7. Hauzel *v.* California Electrical Works, 51 Federal Reporter, 754.
8. H. Tibbe & Sons Mfg. Co. *v.* Lamparter, 51 Federal Reporter, 763.
9. Canton Steel Roofing Co. *v.* Kanneberg, 51 Federal Reporter, 599.

Labels on Glass, Porcelain, and Iron.

The following is recommended in *Nouveaux Remedes:* 120 grm. of gum arabic and 30 grm. of gum tragacanth are macerated separately in a little water; the latter mixture is agitated until a viscous emulsion is formed, when the gum arabic solution is added and the whole filtered through fine linen. With this liquid are then incorporated 120 grm. of glycerine, in which 2·5 grm. oil of thyme have been dissolved. The volume is then made up to one liter by the addition of distilled water. This paste is said to possess remarkable adhesiveness, and to keep well in sealed flasks.

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[WRITTEN FOR THE SCIENTIFIC AMERICAN.]

STRANGE HYBRIDS.

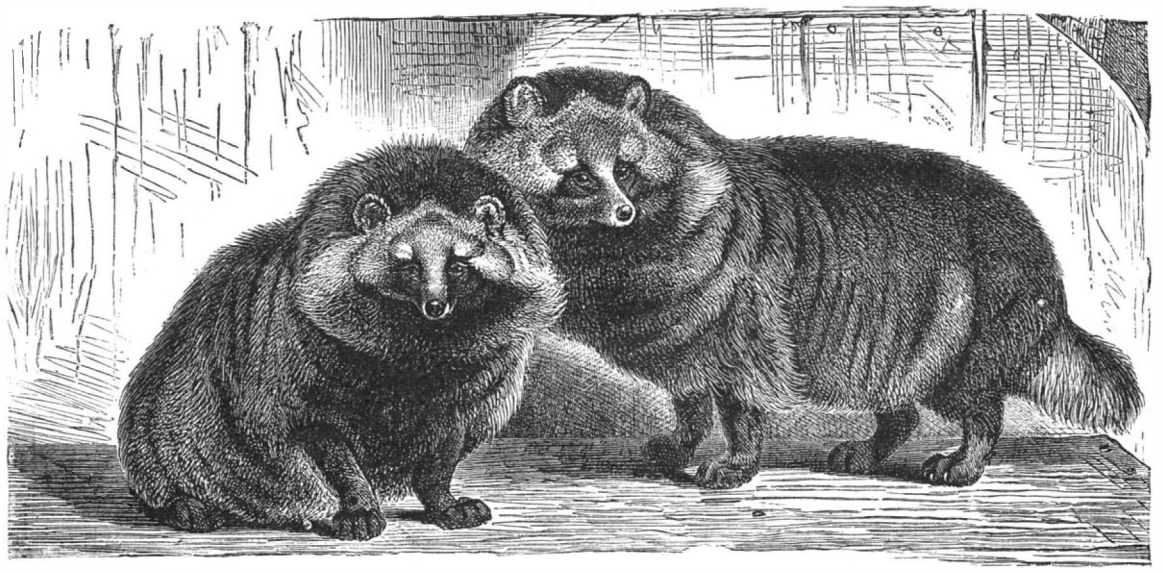
BY F. L. OSWALD.

The proverbial admixture of mishaps in the luckiest events has often been experienced by the discoverers of happy theories, and Darwin's "Origin of Species" seemed at first as irreconcilable with the phenomena of hybridism as Lucian's "slow and steady sunrise of culture" with the midnight of the middle ages.

Recent experiments seem, however, to prove that the alleged permanence of species has been considerably overrated. Prof. H. D. Karsen, of Riga, reports that the deer and the roe can be crossed to any desired extent, and a correspondent of the *Journal de la Physiologie* (vol. ii., p. 374) describes a "rabbit farm" in the neighborhood of Angouleme, where Mons. Charles Roux succeeded in cross-breeding hares and conies. The hybrids again could be crossed as readily as black and white rats, and in several cases proved more fertile than the parent species. The post trader of Fort San Gabriel, in southern Mexico, told me a few years ago that he was one night awakened by the rabid barking of a pet spaniel, and on searching the yard with a lantern found that a large wolf had crossed the ditches and forced his acquaintance upon a mastiff bitch. The offspring of the *mesalliance* were killed; but a similar occurrence in the Russian Caucasus was reported in time to save the curious hybrids, which last year were exhibited in Tiflis, and sold at a considerable advance over the average price of pet wolves. A litter of wolf puppies in the Zoological Garden of Cincinnati, O., now attracts more sight-seers than the baby jaguars, and will probably remain in their present quarters. They are the progeny of a gray wolf and a female Esquimau dog, and strangely combine the characteristics of their shaggy parents. At the approach of a visitor they will at first retreat with a wolfish leer, but presently crouch down, wagging their bush tails and whining, after the manner of a penitent poodle dog. Their snarls and yelps in a scramble for tidbits likewise resemble the dinner concerts of a dog kennel, but they do not bark. Their nearest approach to the alarm signal of a watch dog is a coughing whoop, followed by a long-drawn howl.

The menagerie of the Englische Garten, of Munich, boasts a similar attraction: a pair of lynx kittens romping about in charge of their mother, who seems rather puzzled at the premature savageness of their scrimmages, and sometimes hides in a corner, as if ashamed to own her relationship to the vindictive youngsters. Two of their sisters died before they had opened their eyes, but the survivors have passed the perils of the teething period, and it would be interesting to know if they will prove as sterile as the ocelot-leopards in the Hamburg Zoo.

A few years ago a farmer of Polk County, Tennessee, found a woolly fawn on a plateau of the Chilhowee Range, where sheep had been permitted to run half wild all summer. The curious little waif was adopted by a neighbor, but died from overpetting, and the contradictory accounts of its appearance left the current explanation of its origin rather doubtful. Analogous cases have, however, been recorded in Italy and Switzerland, and rams have been known to breed with goats and female roes. The Alpine ibex or steinbok (*Capra ibex*) visits goat herds wherever the raids of pot hunters result in an excessive competition for the few remaining females of its own species, and the Zoological Garden of Cologne procured a pair of ibex kids that were nursed by a common goat (not their mother), who at first appeared to have taken a liking to the curious hybrids, but neglected them as their uncongenial temper became more apparent, and they both died in the course of the next winter.



SIBERIAN FOX-DOGS.

The editor of *The Field* mentioned a case of a prolific union having taken place between a mastiff and a lioness who had been kept in the same cage, but subsequent investigations justified a doubt in the possibility of that unique instance of hybridity between animals of different *genera*, though as eminent a naturalist as Louis Buffon seems to have believed in the existence of bull-headed colts, owing their paternity to the union of a stallion and a cow. Columella, the Roman Humboldt, indorses that belief, together with a number of such evident myths, that Buffon undertook a long journey to investigate a test case, which, however, left the controversy undecided, since the problematic foal turned out to be a young hinny—half horse and half donkey. Zebras, quaggas, and horses, on the other hand, interbreed as freely as Mr. Roux's rabbits, and the same may be said of several species of African antelopes, such as the koodoo and the gemsbok.

Lion-tigers have been born in several menageries, but the most interesting hybrids seen in the second half of this century were a litter of Siberian fox-dogs. Their mother had been a spitz and their male progenitor a black fox, and there was, withal, something strangely raccoonish in their appearance that would have warranted the suspicion of a triple *mesalliance* if the *Procyon lotor* were not a total stranger to the fauna of the eastern continent. The pretty little pets had been born in the Amoor district, where the mercury of the Fahrenheit thermometer sinks to sixty degrees below zero, and were accordingly well equipped with Siberian furs, so much so, indeed, that their appearance suggested a plan of perpetuating the breed for the sake of its peltry value. They were exhibited in the Berlin Thiergarten till an agent of the Regent's Park Zoo persuaded the managers to exchange them for a pair of mane baboons.

Cases of spontaneous hybridism (between animals in a state of nature) have been rarely observed, but their possibility is suggested by the existence of animals that appear to form a connecting link between different species, or even genera, as the big horn of our Rocky Mountains, which seems to unite the head of a moufflon sheep with the body and the color of a deer. There are birds that hold the exact middle between the titmouse and the woodpecker, and between the woodpecker and the thrush, as the dormouse bridges the gap between the rats and the squirrels and the horned toad between the lizards and the frogs.

The classification of such intermedium creatures has, indeed, often puzzled naturalists, as in the interesting case of the Persian dove-partridge, a gregarious bird that haunts the steppes of Central Asia, and rears a brood of chicks resembling young quails, but whose flight and general appearance differ so much from those of a prairie grouse that in our zoological gardens it is often mistaken for a true pigeon.

IBEX KIDS.

Antiseptic Paper.

An antiseptic paper, which, it is stated, may be applied over wounds and fixed in position with a bandage, can be prepared by impregnating sheets of unsized paper with mercuric chloride. This is dissolved in the proportion of two and a half drachms to a pint of distilled water (previously sterilized by boiling), and six drachms of pure glycerin added. After thoroughly soaking, the paper is allowed to dry, and is then ready for use.—*Therapeutic Gazette.*

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RECENTLY PATENTED INVENTIONS.

Engineering.

ROTARY ENGINE.—Albert D. Bellinger, Black River Falls, Wis. This engine has a cylinder with a ring lining having annular shoulders, a wheel turning in the cylinder comprising a rim carried by a spider, a lining held on the rim and packing plates extending from it and its lining to the shoulders on the lining of the cylinder, rings being secured to the outer edges of the rim to hold the packing rings in place. The invention also embraces various other novel features, designed to form a simple and durable engine which will utilize the motive agent to its fullest extent while reducing friction to a mimimum and compensating for any endwise thrust or movement of the shaft, so as not to disturb the relative position of the piston and cylinder.

SPARK ARRESTER.—Harry B. Maxwell, Stromsburg, Neb. The exhaust chamber, according to this improvement, has a reducing nozzle, and an exhaust nozzle is held to deliver into the nozzle of the chamber, while a longitudinally adjustable petticoat pipe is held in the chamber nozzle, the arrangement, instead of interfering with the draught of the engine, being designed to increase the draught, while absolutely preventing any live sparks from being thrown from the stack, which is provided with a convenient carrier to receive and carry the sparks to any desired point.

FLUE CLEANER.—Perry A. Burgess, Steamboat Springs, Col. This device comprises a blade to which is hinged a handle and an adjusting rod, the other end of the latter being detachably secured to the handle, while the rod also works through a guide secured to the handle. The device may be inserted through a small aperture and adjusted after being entered to extend transversely to the pipe or flue, the guide serving to hold the adjusting rod in the correct position, and also stiffening the rod to act as an efficient brace.

Electrical.

RAILWAY SIGNALING CIRCUIT.—Louis Thaler, New York City. Combined with non-insulated track rails are connected insulated bars in parallel with and sustained on the rails slightly above their top faces, there being a battery and an electric indicator in open circuit with the bars, the circuit to be closed by the car wheels depressing the bars. The apparatus affords a simple mechanism for the automatic electric operation of a signal at a station when the block is occupied, the circuit being completed through the ground as part of the circuit at any point of a block entered or occupied by a car or train.

STREET ELECTRIC LAMPS.—Charles R. Eddy, Springfield, Mo. This invention provides a simple and inexpensive windlass for raising and lowering street electric lamps, for cleaning and supplying new carbons, etc. The device has a detachable crank member, having unlocking means by which the shaft-locking devices of the windlass may be operated to unlock them when the crank is applied, the shaft of the windlass being normally held locked. Only a single crank is necessary for operating a number of windlasses, which automatically lock themselves as soon as the crank is removed.

INSULATOR.—Augustus R. Lane, New York City. This device consists essentially of a somewhat C-shaped metal frame, with a screw projecting from its bottom portion, whereby the frame may be attached to a pole or other support, and a set screw passing through its upper portion, to bear upon and hold in position in the frame the insulator, consisting preferably of two sections of glass, having opposite grooves in which the conductor is held when the sections are placed together and held in position by the set screw. Several of these clamp frames may be formed upon a single skeleton frame if desired, needing only one screw extension for attachment to a support.

Mechanical.

ANTI-FRICTION BEARING.—Peter Beckman, Bucksport, Me. This is a novel form of bearing in which a vertical shaft is held to turn in a support having horizontal bearing portions, there being on the shaft a bearing disk rolling on balls traveling in annular grooves in the lower face of the disk and the upper face of the bearing portion. To prevent lateral thrust or movement and further decrease friction, similar balls are arranged in annular grooves in the bearing portions and around the shaft.

HAND POWER ATTACHMENT.—Finley M. Foster, New York City. This is a simple and inexpensive device whereby sewing machines, etc., may be run by lever power actuated by hand, or in conjunction with foot power applied in the usual way. Clamp plates to be firmly screwed on the machine support a shouldered bolt which forms a journal for a hand lever, whose outer end is connected with a pitman adapted for connection with the treadle, so that by operating the hand lever the machine may be run without pressing upon the pedal.

LUBRICATOR.—Charles Tregoning, New York City. This is a device especially adapted for use upon elevator machinery, whereby all the pulleys on a shaft may be simultaneously and constantly oiled, the amount of oil used being under ready control. The shaft on which the pulleys to be oiled are mounted has an exterior longitudinal channel in which is fitted a tubular valve, each pulley covering an aperture in the valve casing. At the open end of the valve casing is a head with which is connected an oil cup and an adjusting device, the latter being adapted to move a valve slide adapted to open or close the apertures in the valve casing, whereby the flow of oil is readily controlled.

Agricultural.

HARROW.—Niels L. Beck, Brayton, Iowa. According to this improvement, the construction of the body of the harrow is such that the body may conveniently be made as long or as wide as may be desired, and be readily put together in a short time. A principal feature of the invention is the construction of the harrow teeth and their location in blocks, each block being adapted to carry a tooth, and the manner in which the blocks are attached to the frame, the blocks serving not only as carriers for the teeth, but as binding or connecting devices for the frame.

CORN PLANTER ATTACHMENT.—Andrew W. Trotter, Petersville, Ind. This is a furrow-closing or covering attachment located at the rear of the seed drop tube, and consists of a standard secured to a fixed support on the planter, and carrying a covering wheel at the rear of the lower end of the seed drop tube, the wheel standing at angle to the path of this tube and diagonally across the furrow made by the plow. The device closes the furrow and distributes the soil evenly over the seeds dropped therein.

SEED PLANTER.—Alexander Learmouth and Arnold A. Beltman, Tower City, North Dakota. This is an improvement in planters which have furrowing wheels mounted in elastic or spring bearings. These wheels are made as light as may be desirable, and each wheel has an independent bearing, so arranged that the wheel is normally held down with considerable force by a spring-pressed plunger, but should the wheels encounter any obstacle, they are free to rise and pass over it, at once resuming again their normal position to continue the trough or furrow.

SPRINKLING DEVICE.—Henry I. Schanck, Holmdel, and Charles B. Ellis, Freehold, N. J. The frame of this device is carried upon wheels, to be drawn by an animal, and supports a cask or other liquid-holding vessel, for the mixing and distribution of liquid preparations upon growing plants. The device forms an efficient poison distributor, the liquid being projected out upon the plants from a jet nozzle.

Miscellaneous.

VIOLIN SUPPORTER.—Giorgio Narberti, 318 Second Avenue, New York City. This is a device to hold the violin in correct and artistic position on the body of the performer, enabling the latter to play and lead at the same time. The invention consists principally of an arm having a limited swinging motion on the end of the violin body, a breast plate pivotally connected at one end to the free end of the arm, and a locking device for locking the breast plate to the arm in either a vertical or horizontal and folded position. A curved collar or neck plate is also secured by a set screw in a socket on the free end of the arm, and the collar and breast plate both engage the body of the performer to hold the violin in proper place, facilitating the execution of any desired passage of music with great ease, so that full, rich sounds are produced.

PIANO.—William P. Haines, New York City. According to this improvement, brackets formed with guideways support the action, and a rail sliding in the guideways carries strips of damper fabric adapted to be moved into or out of the path of the hammers, so that the player can, without changing his position, instantly change the piano from loud to mute, or *vice versa*, as may be desired for practicing or other purposes.

GRAND STAND.—Pascal P. Cuplin, West Bend, Iowa. This is a stand which may be revolved, either having a revoluble base held to float in a reservoir or being mounted to be turned on a post by gear teeth on the flange of the base, the usual superstructure of such a stand being carried by the base. It is more especially adapted for use in connection with race tracks, as it may be placed inside the track, thus being nearer all portions of the course than is possible with a stand placed outside the track, while the revolving of the stand during the progress of the race keeps the competitors all the time in view.

CULVERT.—Charles B. Davis, Savona, N. Y. This invention consists of two series of curved metallic plates placed one on top of the other to break joints, and riveted together to form a double-walled arch, flanges being formed on the ends of the sets of plates and bent in opposite directions to form a foot for the arch. The construction forms a simple and durable culvert, readily set up in place and cheaply manufactured, stones or other material being placed on the top of the metallic arch to finish the culvert as desired.

FAN.—Theodore F. Davis, Marshalltown, Iowa. This invention provides an improvement in the class of fans used upon grain separators to blow the grain and chaff upon and over the riddles and sieves, the fan having an air opening the entire width of the fan blades and parallel with the axis of the fan, so that there is a perfectly equal and even current of air generated, enabling the grain to be perfectly cleaned. The opening has a cap or damper which may be nicely controlled to admit just the desired amount of air to the fan casing.

FIRE ESCAPE.—Perry A. Burgess, Steamboat Springs, Col. This device has a frame to be hung where convenient on the building, and a harness for adjustment on the user, the weight of a suspended body causing a sprocket wheel and ratchet wheel in the frame to be turned, actuating an escapement which takes the place of a brake and permits one to descend safely to the ground. The escape also forms a convenient means for lowering valuable packages. The device is so compactly constructed that it may be conveniently carried in a person's luggage.

DENTAL APPLIANCE.—Samuel P. Sharp, Knoxville, Tenn. This is an improvement in the class of angled tool holders for dental engines. The improved attachment may be applied to any existing form of dental engines, or it may have a handle of its own especially adapted to it.

MAKING EXTRACTS.—John E. McCarty, Elkins, West Va., deceased (Ella M. McCarty, administratrix). This invention covers a process and apparatus, according to which the material to be acted on is submerged in hot water in a closed vessel, under regulated pressure and temperature, while simultaneously and mechanically there is produced a vertical circulation of hot liquid through the mass. The invention is designed to effect economy in the extraction of tannin from barks and wood, reducing the time and obtaining a larger percentage of tannin.

BAG OR POUCH.—Frederick M. Turck, New York City. This invention provides a fastening device which may be used upon all kinds of receptacles for mailing purposes, or for the transportation of merchandise, when the receptacles are of paper, fabric, or other pliable material. The means of attaching the flap to the body of the bag are simple and durable, inexpensive, and capable of quick and ready manipulation.

APPARATUS FOR MANUFACTURING SALT.—John Runciman, Goderich, Canada. This apparatus comprises an annular evaporating pan, within which and sloping upward and inward is arranged a drying table having an outlet at the center, in connection with mechanism to transfer salt from the pan to the drying table and work it upon the latter to the central outlet or discharge. The salt is made from brine, and the drying of the salt and making it ready for grading and packing are much expedited by this apparatus.

WATCH CHAIN CHARM, ETC.—Samuel A. Stahl and Benjamin Klipper, Knoxville, Tenn. This is a charm or piece of jewelry of globe form, representing the land and water of the earth, with holes through it at places of historical or national importance, in combination with a microscope inserted at such places and containing views illustrative of the events which give notoriety to the places.

BICYCLE GEAR.—William Mahoney, New York City. This is a speed-multiplying gear, for use in connection with safety bicycles, so that a person may drive the machine very rapidly without making his feet move very fast.

FIRE KINDLER.—Albert Johnson, Haverhill, Mass. A cheaply formed wire handle has at one end a loop to which is fastened a swab made of leaves of asbestos or other indestructible absorbent, and the swab is kept immersed in oil until required for use, when the absorbed oil adapts it for burning a long time. The device may also be advantageously used for thawing pipes, burning insects off trees, and for other purposes.

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NEW BOOKS AND PUBLICATIONS.

FINITE HOMOGENEOUS STRAIN, FLOW, AND RUPTURE OF ROCKS. By Geo. F. Becker. Bulletin of the Geological Society of America. Vol. iv. Pp. 13–90. Rochester, N. Y. 1893.

The author uses mathematics freely in support of his views. The subject is a difficult one, and the present pamphlet will be a welcome addition to the literature of physical geology.

SCIENTIFIC AMERICAN BUILDING EDITION.

FEBRUARY, 1893, NUMBER.—(No. 88.)

TABLE OF CONTENTS.

1. Elegant plate in colors, showing a very picturesque dwelling at St. David's, Pa. Floor plans and perspective elevations. An admirable design. Mr. N. Trumbauer, architect, Philadelphia, Pa.
2. Plate in colors showing a residence at Bridgeport, Conn. Two perspective views, one interior view and floor plans. Messrs. Longstaff & Hurd, architects, Bridgeport, Conn. An excellent design.
3. A model dwelling at Holyoke, Mass., erected at a cost of $6,000 complete. Perspective views and floor plans. H. W. Coolidge, architect, Holyoke. A pleasing design.
4. A cottage erected at Cranford, N. J., at a cost of $5,000. Floor plans, two perspective views, etc. F. W. Beall, architect, New York.
5. The First Baptist Church recently erected at Warberth Park, Pa., at a cost of $6,000. A unique design in the Gothic style of architecture.
6. A residence recently erected at Bridgeport, Conn., at a cost of $5,900 complete. A picturesque design. Perspective elevation and floor plans. Mr. C. S. Beardsley, architect, Bridgeport.
7. An elegant residence recently erected at Newton Highlands, Mass. Perspective view and floor plans. Cost complete $6,472.
8. An attractive design for a suburban dwelling at Holyoke, Mass. Perspective elevation and floor plans. Messrs. Gardner, Pyne & Gardner, architects, Springfield, Mass.
9. A row of model dwelling houses on West Sixty-eighth Street, New York City. An exquisite design. Floor plans and perspective.
10. A cottage at St. David's, Pa., recently erected at a cost of $5,100 complete. Floor plans and perspective elevation. Messrs. F. L. & W. L. Price, architects, Philadelphia.
11. Views of the extensive red sandstone quarries at Potsdam, N. Y., together with views of various public and private residences built of Potsdam red sandstone.
12. Perspective and floor plans for an architect's residence at Buffalo, N. Y.
13. Miscellaneous contents: Architecture in brick—Architecture and the phonetic arts.—The housing of workers.—Concrete roofs.—Roman temples.—An automatic perspective machine, illustrated.—Drake's Columbus drinking fountain.—Sleigh bells.—A planing machine requiring little room, illustrated.—An improved side and roofing tile, illustrated.—An improved spring hinge, illustrated.—An improved hand planer and jointer, illustrated.—To darken oak.—An improved automatic water gate, illustrated.

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The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(4684) D. G. E. asks: How many pounds of coal will be required to heat one ton of sand from 40° Fah. to 212° Fah., the sand being contained in an iron cylinder 12 inches in diameter and surrounded by the fire, and bituminous coal being used. A. It will require 61 pounds of good coal, provided no heat is lost; practically 100 pounds of coal is near the quantity required.

(4685) F. W. T. writes: I have "Experimental Science," and there are a few things I would like to ask you with reference to the simple motor on page 499. 1. In Fig. 486, should the wire used in making the core of the armature be insulated or should it just be covered with adhesive tape when it is finished? A. It is of some advantage to varnish the iron wire used in making the armature core before it is wound on the spool, unless the wire is sufficiently oxidized to practically insulate it. 2. Should it be iron or copper wire? A. By referring to the description of the motor given in "Experimental Science" you will notice that copper wire will not do. The core should be made of soft iron wire. 3. About how near should the armature come to touching the wider part of the field magnet when the motor is in position? A. As near as possible without coming into actual contact with the field magnet. 4. Should the armature revolve on the steel shaft like a wagon wheel on the axle or should it be stationary in the armature and revolve in the journal boxes? A. The armature should be secured to the shaft so as to carry the shaft with it. 5. How are the commutator brushes made? A. The commutator brushes are simply bundles of very thin spring copper. 6. Wouldn't it be cheaper to buy them? A. No. 7. Is the current from the battery sent through the same binding posts as those to which the commutator brushes are attached? A. Yes.

(4686) G. E. H. asks: 1. What is the E. M. F. of a 2×3 zinc carbon cell? A. 1·75 to 2 volts.

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Size has no connection with voltage. 2. What is the E. M. F. of an ordinary phonograph cell? A. Two kinds of primary battery are used. One is the bichromate cell, giving 1·75 to 2 volts. The other is the Lalande-Edison cell, giving 0·5 to 0·75 volt. 3. Will you name a treatment for tartar on the teeth? A. Let a dentist clean them once a year. Use best quality of tooth powder. It is an excellent practice to rub the teeth with a stick of wood the end of which has been chewed to a brush.

(4687) L. G. asks: What changes will be necessary in the 8 light dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 600, to change it to a motor of at least 1¼ horse power, to run on a 110 volt circuit? How are spherical armatures wound? Have you a SUPPLEMENT describing same? A. We think the dynamo to which you refer is too small for 1¼ horse power. In the construction of a machine to run on a 110 volt circuit, we advise you to consult SUPPLEMENT, No. 844, containing a description of the small Edison dynamo and motor. We believe spherical armatures are wound on the open circuit plan. Nearly all the books on electric winding describe this winding.

(4688) W. E. P. & A. F. K. ask: Do rivers which flow toward the equator, by reason of the centrifugal force, of a necessity flow up hill? and Why the Nile runs north and the Mississippi runs south? A. All rivers run down hill by the force of gravity. The spheroidal form of the earth is due to gravity, modified by its centrifugal force, and of which the surface of the ocean is the fixed datum or level. All streams, whether running north or south, that are above the datum of the sea level run by virtue of theses two forces to a lower level. The fact of streams running farther from the earth's center is no paradox, when the true relations of the forces that hold the earth's surface to its spheroidal form are considered. The conditions of gravity and centrifugal force apply equally to running water and to the general form of the solid surface of the earth.

(4689) L. B. says: I wish to put a stern paddle wheel in a flat bottom boat,15 feet long, 3½ wide, for shallow water. I have a 50 pound fly wheel, 30 inches diameter. How many paddles, what size, what diameter of wheel, and how many revolutions per minute would be best? What is limit of speed in such a boat, power same manner as in bicycle? A. Make your wheel 2 feet wide, 4 feet diameter, 12 buckets 6 inches wide, 50 revolutions per minute. Will give you a speed of about 5 miles per hour. Doubtful if you can get this speed in the way you propose to work the wheel.

(4690) F. T. R. asks: What would probably be the result if a channel were cut into the crater of Vesuvius below sea level and the water allowed to flow into it? A. Probably it would become an extinct volcano if the quantity of water were sufficient.

(4691) E. A.—For information on electroplating machines we refer you to the SCIENTIFIC AMERICAN SUPPLEMENT. Glass after being ground to a smooth surface is polished by means of rouge or putty powder. Coffee grows on bushes to a height of from 9 to 15 feet.

(4692) C. S. J.—Tabby is a shell concrete, made of equal parts of lime, broken shells and sand. The old tabby buildings along the Southern coast derive their strength from good work and age. Have no literature on this subject.

(4693) J. G. asks: Was the subject, "The Human Body as a Maguet," ever discussed in the SCIENTIFIC AMERICAN? A. We do not call to mind any scientific articles on the human body as a magnet. We do not think magnetism was ever discovered in the human body.

(4694) R. L.—You can use four cells of Crowfoot battery to each cell of storage battery for charging. Gravity batteries, which are not expensive, can be purchased from any of the dealers in this city.

(4695) P. & D. ask: Does the upper part of a wheel move faster than the lower in rotating? A. The upper part of a carriage wheel in traveling on the ground moves much faster than the lower part of the wheels. It has several times been explained in SCIENTIFIC AMERICAN.

(4696) S. A. C.—The best single book for the study of armature winding is Thompson's "Dynamo Electric Machinery," which we can furnish by mail for $9.

(4697) M. J. K. writes: My brother is going to start a brass foundry. What I wish to know is, what height and width (or area) will the stack or chimney require to be for two or three fires for melting brass. We have the furnace for small crucibles which has a grate surface of 14×14 inches=196 inches or 1⅓ square feet nearly. We want the other fires to be larger, say 2 feet square for large crucibles. If you can furnish or give paper on the same would be very thankful. A. You will seldom run more than two furnaces at once, which will indicate a good sized business. A chimney 16 inches square inside and 50 feet high should give ample draught for your furnaces. We have no paper on brass foundry plant, but have an excellent book, "Brass Founders' Manual," by Graham, $1 mailed. Larkin's "Brass and Iron Founders' Guide," $2.25 mailed.

(4698) W. C. M. writes: Kindly tell me of a preparation that I can use, not to be costly, that I can form or press in a plaster flask like accompanying sample. Also tell me if you know of any attempts to make locomotive boilers return tubular and what was the objection to them. About what is the difference in saving of fuel between a straight flue boiler and a triple return tube? Would not half the number of flues that are in a locomotive boiler be sufficient to carry off the smoke and gases? A. The sample appears to be blotting paper saturated with a composition of tallow, beeswax, and a little oil to soften the mixture. We know of nothing cheaper that has the properties you require. The area of the tubes of a locomotive is not large enough in the present construction to allow the gases of combustion to move slow enough to have their heat absorbed. There will be no gain by returning the tubes unless the shell is made larger.

(4699) C. C. P. asks: Can very hot air be pumped into a boiler with an air compressor so as to do one-third of the work? Will it not all be condensed? If it can be done, is there any economy in using air with steam? Is it safe to use air mixed with steam? Is it practical? A. Air, hot or cold, can be pumped into a steam boiler for useful work. There is no danger nor is there any profit. It condenses according to the pressure and does not give out as much work as it costs to put it in the boiler.

(4700) H. A. G. asks how to temper twist drills uniformly, that is to temper the whole drill at once. A. Twist drills should be packed in sand in an iron box and heated slowly to a cherry red, then dipped vertically in water. Brighten the surface and heat the drills evenly till an orange brown color appears on the bright surface.

(4701) H. H. B. asks: 1. Is a coil of a magnet the same resistance as the wire before it is wound on the coil? A. The resistance of the wire after it has been coiled on the magnet is slightly greater than it is in the original coil, on account of the hardening of the wire by bending. The difference however is very small and is negligible. 2. Would it release a building from danger of being struck by lightning if it were well insulated from the earth? A. No. 3. What can you put in sorghum so that it won't melt down in warm weather? The taffy is for making popcorn balls. A. Boil it for a longer time. Do not put in anything additional.

(4702) D. B. says: The purpose for which the answer is required is for a system of water works, distance from inlet to outlet of pipe 6 and 10 miles respectively; height or fall from inlet to outlet 100 and 125 feet respectively; size of pipe 4 and 6 inches. Question: Number of gallons that would flow through the outlet of a 4 inch pipe with a fall of 100 feet? Also from a 6 inch pipe with a fall of 125 feet? A. The 4 inch pipe, 6 miles, 100 feet head, will deliver 63 gallons per minute. The 6 inch pipe, 10 miles, 125 feet head, will deliver 151 gallons per minute.

(4703) C. E. H.—Aluminum weighs 163 pounds per cubic foot, pure, casting. Much that is called pure weighs 165 to 170 pounds per cubic foot.

(4704) L. C. asks: 1. What is the proper oil to use in coloring hard pine floors? A. Use boiled linseed oil for floors. 2. Is there any coloring matter which you can put in the oil which will make them darker? A. A little burnt umber in the oil for darker shade. 3. What is the best method to apply the oil? A. Apply by rubbing the oil stain on the floor with a coarse woolen cloth. As little excess of oil as possible, so that it will dry quickly. For a new pine floor nothing is better than shellac varnish.

(4705) Constant Reader.—For a general description of the process of zinc etching, see SUPPLEMENT, No. 656. For fuller information, see Schraubstadter's "Photo Engraving," price $3. We can also supply Wood's "Modern Methods of Illustrating Books," by mail for $1.50.

(4706) H. P. R. asks: Why are coil pipes used on some steam gauges and not on others? A. Every steam gauge should have an inverted siphon in the connecting pipe to prevent the steam reaching the interior of the gauge to its injury. This may be a small coil or the pipe may drop enough to prevent the water returning to the boiler and the steam from reaching the gauge.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

February 14, 1893,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Accumulator, W. A. Macleod ... 491,726
Advertising device, A. G. Macdonell ... 491,900
Air engines, heater for conpressed, R. C. Smith ... 491,859
Air motor for propelling wheeled vehicles, compressed, J. Kames ... 491,892
Alarm. See Gas alarm.
Album, easel, W. A. Holman ... 491,942
Amalgamator, ore, F. O. Norton ... 491,686
Ammonium chloride, apparatus for volatilizing, L. Mond ... 491,741
Armature and means for supporting the same, E. Kolben ... 491,568
Armature conductor, E. Kolben ... 491,567
Axle box, car, J. S. Speer ... 491,819
Axle lubricator, L. E. Atkinson ... 491,671
Badge, pencil, and bouquet holder, combined, H. O. Thomas ... 491,614
Baling press, W. H. Kenner ... 491,967
Ball throwing device, J. P. Hill ... 491,558
Band cutter and feeder, J. C. Brash ... 491,522
Barrel heading press, B. S. Miles ... 491,847
Battery. See Secondary battery.
Bearing, ball, S. Elliott ... 491,938
Bearing, roller, Berry & Oliver ... 491,867
Bearing, roller, A. Petterson ... 491,585
Bee hive, G. W. Stephens ... 491,619
Belt, endless carrier, L. Z. Preston ... 491,953
Belt tightener, J. J. Miller ... 491,728
Bending roll, W. Lewis ... 491,968
Bicycle tilting seat, W. R. Mercer ... 491,578
Bird warbler, E. F. Long ... 491,571
Boiler. See Cooking boiler. Steam boiler.
Boiler furnace, steam, L. Lawton ... 491,570
Boiler furnace, steam generating, R. H. Alexander ... 491,918
Block. See Musical block. Thrust block.
Bolster plate, H. A. Moyer ... 491,783
Bolt, O. C. Little ... 491,660
Boot or shoe slip sole, G. W. Dixon ... 491,731
Bottling machine, E. T. Jones ... 491,753
Box. See Letter box.
Brace. See Gate brace.
Brake shoe, M. Y. Baldwin ... 491,667
Breast drill, W. H. Wilkinson ... 491,624
Breast strap, H. D. Stoddard ... 491,964
Brick machine, V. F. Lanouette ... 491,657
Brick or tile cutting machine, J. Thompson ... 491,747
Brick press, automatic, T. B. Lewis ... 491,712
Broom rack, W. C. P. Jones ... 491,891
Brush mould, sectional, W. Morrison ... 491,757
Bucket dumping apparatus, F. B. Wineland ... 491,958
Buckle, cast off, G. E. Adams ... 491,630
Butter moulding and cutting machine, P. O. Andreasen ... 491,792
Button fastener, E. L. Torsch ... 491,788
Buttons, device for removing shoe, P. H. Nielsen ... 491,948
Cable grip, Babendreier & Davis ... 491,934
Camera. See Photographic camera.
Camera shutter, Blair & Kelley ... 491,921
Car brake adjuster, F. & J. W. Cyr ... 491,535
Car brake handle, C. D. Lyon ... 491,969
Car brake mechanism, Roberts & Wheater ... 491,664
Car coupling, A. Carlson ... 491,668
Car coupling, W. P. Clark ... 491,835
Car coupling, I. David ... 491,924
Car coupling, T. E. W. Fay ... 491,839
Car coupling, D. R. Jones ... 491,562
Car coupling, C. A. Pooley ... 491,589
Car coupling, J. W. Steele ... 491,862
Car coupling, F. Stenger ... 491,929
Car coupling, W. W. Swank ... 491,612
Car coupling, W. J. Walker ... 491,823
Car draught rigging, P. M. Reagan ... 491,785
Car for transporting horses, railway, W. A. Caswell ... 491,996
Car hook, stock, B. C. Hicks ... 491,803
Car roof, Veronee & McInerney ... 491,909
Car seat, Aze & Gilfillan ... 491,761
Car, tram, J. Stephenson ... 491,608
Cars, directly connected motor for, S. H. Short ... 491,667
Carpet sweeper, S. H. Raymond ... 491,964
Carriage top crate, B. B. Breed ... 491,869
Cash register, J. Pfeifer ... 491,587
Cash register and indicator, H. J. Gilbert ... 491,546
Cash register and indicator, H. C. Pritchard ... 491,593
Cash register and till, A. L. Crawford ... 491,876
Caster, P. J. Lennard ... 491,710
Chains, shield or covering for drive, S. Elliott ... 491,750
Chair. See Convertible chair. Dental chair.
Chair, C. B. Halsey ... 491,724
Chair and table, combined, B. Poulson ... 491,590
Chimney, door, J. Hohenreiner ... 491,735
Chimney top, E. Finch ... 491,678
Chimneys, flues, etc., cap for, H. Moeller ... 491,848
Chlorine, preparing liquid, E. B. Cutten ... 491,699
Churn, H. C. Alexander ... 491,917
Churn, A. C. Fell ... 491,677
Churn, T. W. Hambric ... 491,644
Churn, J. A. Kernodle ... 491,737
Chute, ash, T. Connor ... 491,960
Cigar or cigarette holder, Baumgartner & Dreifuss ... 491,631
Cigar and cigarette holder, M. C. Roebel ... 491,744
Cinder and smoke consuming apparatus, F. Little ... 491,738
Circuit closer, time, R. H. Twigg ... 491,692
Clamp. See Colter clamp.
Clamp, P. E. Bourassa ... 491,633
Clay to make ballast, etc., burning, W. & H. G. Butler ... 491,764
Cleaner. See Flue cleaner. Oat cleaner.
Clock, self-winding electric, E. Klahn ... 491,945
Clothes pounder, A. C. McKinney ... 491,685
Clover hulling machine, A. Miller ... 491,740
Coloring matter from logwood and preparing same, P. T. Austen ... 491,972
Colter clamp, plow, G. A. Lambert ... 491,895
Combination lock, W. A. Schenck ... 491,598
Convertible chair, C. Schulte ... 491,602
Cooking boiler, sectional, C. W. Wynn ... 491,866
Cork mat for bath rooms, A. Morton ... 491,851
Coulomb counter, G. Hummel ... 491,560
Counting register, W. N. Durant ... 491,537
Counting tickets, gauge for, C. H. Farnham ... 491,800
Coupling. See Car coupling. Locomotive coupling. Thill coupling. Whiffletree coupling.
Crane, H. Aiken ... 491,933
Crimping machine, J. Zeh ... 491,913
Cultivator, C. Bizi ... 491,632
Cultivator, A. W. Butt ... 491,797
Cultivator, M. Casey ... 491,873
Cultivator, W. A. Wagner ... 491,822
Cultivator, J. F. Waltrous ... 491,618
Cultivator hoe attachment, Eriksen & Day ... 491,676
Cup. See Oil cup.
Current generator, alternating, O. Patin ... 491,811
Curtain holding device, Piper & Davis ... 491,588
Cutter. See Band cutter. Vegetable cutter.
Cyclometer, E. J. Merry ... 491,739
Dental chair, D. Stuck ... 491,611
Dental chair bracket, D. Stuck ... 491,610
Dental forceps, C. E. Blake, Sr ... 491,514 to 491,519
Dental forceps, A. Whitlock ... 491,932
Desk support, F. W. Tobey ... 491,615
Dice throwing machine, coin-controlled, Williams & Roovers ... 491,971
Draught regulator, C. D. Howard ... 491,752
Dredges and sand pumps, agitator for suction, W. T. Urie ... 491,748
Dredging apparatus, W. M. Douglas ... 491,723
Dredging apparatus, J. E. Kauser ... 491,843
Drill. See Breast drill.
Drill sharpening device, A. Campbell ... 491,766
Egg beater, J. M. O'Neill ... 491,583
Electric machine, alternating current dynamo, J. J. Wood ... 491,695
Electric motor, A. W. Meston ... 491,970
Electric motor and dynamo mica insulator, C. W. Jefferson ... 491,708
Electric motor regulator, J. A Williams ... 491,829
Electric signal, F. H. Clarke ... 491 874
Electrodes, manufacture of secondary battery, R. M. Lloyd ... 491,684
Elevator and carrier, combined, C. M. Bates ... 491,511
Elevator door opening or closing device, E. M. T. Boddam ... 491,832
Elevator gate, automatic, P. J. Schreiber ... 491,601
End gate, W. K. Wagner ... 491,617
Engine. See Gas engine. Traction engine.
Envelope, A. R. Spear ... 491,928
Envelope machine, J. Ball ... 491,935
Evaporating liquids, S. M. Lillie ... 491,659
Excavator, M. C. Meigs ... 491,577
Feedwater apparatus, W. V. Walker ... 491,825
Feedwater heater and purifier, F. Goodfellow ... 491,547
Feeding animals, receptacle for, N. J. Felix ... 491,702
Felly boring and spoke tenoning machine, G. W. McAlister ... 491,582
Felting machine, J. W. Millet ... 491,901
Fence machine, hand, M. F. Connett, Jr ... 491,770
Fence, metal, W. Warner ... 491,826
Fence wire reel, S. Moore ... 491,849
File, bill, A. Quortrup ... 491,905
Filter, H. Lieberich ... 491,574
Fishing reel, J. Singer ... 491,955
Floor, O. Hetzer ... 491,647
Flower pot, Schurig & Prufer ... 491,786
Flue cleaner, J. R. Wilson ... 491,791
Flypaper holder, J. H. Smith ... 491,860
Flypaper, machine for manufacturing, Smith & Knowlton ... 491,861
Folding table, H. A. Stevens ... 491,760
Furnace. See Boiler furnace. Pottery kiln furnace. Roasting furnace. Smoke consuming furnace.
Furnace grate blast pipe, E. J. Gordon ... 491,549
Furnaces, apparatus for charging and discharging annealing, J. M. Chatfield ... 491,768
Gauge. See Surface gauge.
Galvanizing iron, apparatus for, G. Retterer ... 491,720
Gas alarm, escaping, C. J. Milligan ... 491,580
Gas burners, self-closing cut-off for, C. H. Keeney ... 491,943
Gas engine, J. W. Raymond ... 491,855
Gate. See Elevator gate. End gate.
Gate, J. L. Chadwick ... 491,637
Gate, B. Miller ... 491,579
Gate brace, C. C. A. Sienknecht ... 491,906
Gearing, variable transmitting, H. C. Behr ... 491,866
Generator. See Current generator. Steam generator.
Grain securing machine, R. W. Welch ... 491,623
Grinding machine, J. H. Crane ... 491,530
Grindstone, emery wheel, etc., D. F. Walker ... 491,789
Guitar arm rest and support, H. E. Le Valley ... 491,755
Gun, magazine, L. M. R. Daudeteau ... 491,772
Handle. See Wire handle.
Harvester, O. O. Storle ... 491,746
Harvester, corn, P. R. Hunt ... 491,889
Harvester elevating and packing mechanism, A. Gardner ... 491,680
Harvester, grain binding, A. Gardner ... 491,641
Hat expanding and contracting apparatus, P. Noe ... 491,853
Hay loader, E. B. Cartmell ... 491,636
Head rest, A. P. Jordan ... 491,651
Heading and reaping machine, Abel & Daly ... 491,629
Heat regulator, J. J. Schrag ... 491,600
Heater. See Feedwater heater.
Heating apparatus, P. Mancheron ... 491,806
Heel pad, I. Levy ... 491,756
Hinge and check, spring, R. E. Lowe ... 491,898
Hinge, stop, G. P. Hart ... 491,645
Hog trap, F. R. Patchett ... 491,810
Hook. See Car hook. Snap hook.
Horse detacher, J. H. Garner ... 491,734
Horse detacher, I. A. McCaslin ... 491,807
Horse detacher, G. Riley ... 491,815
Horse power, E. H. Condit ... 491,528
Horseshoe with auxiliary flanges, J. Gutmann ... 491,643
Hose washer, J. E. Taber ... 491,821
Hot air apparatus, R. H. Yeoman ... 491,627, 491,628
Hot air register, F. Burmeister ... 491,524
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Hub, vehicle, J. T. Hart ... 491,925
Hub, wheel, J. S. Copeland ... 491,987
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Liquids, device for handling, S. R. Mace ... 491,844
Lock. See Combination lock.
Lock, J. D. Bowley ... 491,868
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Motion, mechanism for converting, W. W. Virtue ... 491,910
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Pad. See Heel pad.
Paper bag machine, W. Liddell ... 491,573
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Power. See Horse power.
Power transmitting device, E. Prouty ... 491,759
Press. See Baling press. Barrel heading press. Brick press.
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Pump, oil well, G. D. Bumpus ... 491,674
Pump rod coupler, E. C. Guerrant ... 491,551
Pump, vacuum, W. H. Worthen ... 491,912
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Rack. See Broom rack. Stock rack.
Railway, automatic aerial, H. W. Libbey ... 491,572
Railway crossing plate, C. Vogt ... 491,616
Railway frog, D. Horrie ... 491,842
Railway joint box, E. E. Smith ... 491,787
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Railway series system, G. L. Thomas ... 491,691
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Rake, N. J. Felix ... 491,703
Recorder. See Time recorder.
Reel. See Fence wire reel. Fishing reel.
Register. See Cash register. Counting register. Hot air register.
Registering device for textile fabric machines, etc., M. Keeney ... 491,564
Regulator. See Draught regulator. Electric motor regulator. Heat regulator. Windmill regulator.
Rein holder, A. Foisy ... 491,542
Retort lid, J. P. Clack ... 491,769
Roasting furnace, revolving, C. Fellner ... 491,704
Saddle, side, B. P. Blood ... 491,831
Safe, W. Corry ... 491,875
Sanding drum, W. F. Larish ... 491,658
Sash balance, R. K. Brown ... 491,762
Sash balance, H. L. Craig ... 491,639
Sash cord fastener, S. Jenkinson ... 491,966
Sash fastener, G. Gibson ... 491,881, 491,882
Sash holder, R. K. Brown ... 491,763
Sawmill, band, G. M. Hinkley *et al* ... 491,807
Sawmill feed mechanism, T. J. Reamy ... 491,856
Scaffolding, device for suspending, C. Heinemann ... 491,885
Scraper operating apparatus, H. G. Butler ... 491,765
Scraper, road, J. F. Kimball ... 491,565
Screwdriver attachment, J. R. Quimby ... 491,667
Secondary battery, N. H. Edgerton ... 491,978
Sewage, etc., apparatus for cleansing, W. Birch ... 491,796
Sewing machine, W. H. Hanna ... 491,554

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Sewing machine motor, H. A. Frantz	491,751
Sewing machine table, T. Kundtz	491,654 to 491,656
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Shears, W. Fischer	491,679
Ship ash ejector, steam, G. Clarke	491,959
Shovels, manufacture of, P. W. Groom	491,944
Signal. See Electric signal. Railway signal.	
Signaling apparatus, electric, L. Von Orth	491,758
Signaling apparatus, electrical, J. B. Currier	491,531
Signaling circuits, electric governor for, Currier & Rice	491,532
Smoke consumer, J. T. Ellis	491,775
Smoke consumer, J. Fereday	491,879
Smoke consumer and spark arrester, combined, J. P. Maloney	491,576
Smoke consuming furnace, W. Arnemann, Jr.	491,696
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Strap. See Breast trap.	
Straw cutting machine, W. Roecker	491,745
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Sulky, J. F. Pray	491,591
Surface gauge, G. H. Nutt	491,926
Switch stand, M. G. Prutzman	491,812
Table. See Folding table.	
Tack lifter, M. A. Sheldon	491,818
Tag holder, J. B. Morgan	491,581
Telegraph transmitter, R. S. Roberts	491,595
Telephone call, J. H. Kinsman	491,893
Telephone exchange switching system, C. E. Scribner	491,688
Telephone exchanges, trunk line signaling apparatus and circuit for, E. J. Hall	491,553
Telephone memorandum tablet, W. M. Kleeman	491,777
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Thill support, G. W. Post	491,854
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Thrust block, shaft, W. C. & J. A. Paul	491,584
Tie. See Railway tie.	
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Time recorder, workman's, G. W. Heene	491,556, 491,557
Tire, pneumatic, W. A. Warren	491,620
Tires, automatic inflating device for rubber, R. M. Keating	491,563
Tobacco leaf stripping and stemming machine, G. W. Cable	491,871
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Weather strip, W. H. Plympton	491,952
Well tiling coupler, W. A. Sumner	491,956
Wheel. See Tracing wheel.	
Wheel, T. R. Mc night	491,662
Whiffletree coupling, C. Wilcox	491,790
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Windmill, C. & J. Pyle	491,663
Windmill regulator, H. Grosz	491,550
Window, H. Koepp	491,653
Wire handle, F. W. Hoefer	491,648
Wire stretching device, H. C. Pratt	491,743
Wrench. See Pipe wrench.	
Wrench, W. Bill	491,513
Wrench, W. E. Brooke	491,870
Wrench, C. H. Hommel	491,888
Wrench, W. C. Riesberry	491,721
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Coffin plate, O. McCarthy	22,217
Coin holder, J. Lines	22,216
Escutcheon plate, W. B. Ditmars	22,218
Finger ring, J. Bulova	22,224
Glassware, ornamentation of, W. C. Anderson	22,215
Pitcher, J. G. Donoghue	22,214
Rug, E. H. Bennett	22,210, 22,211
Saloon fixture, D. Rothschild	22,222
Spoon, Birmingham & Grandjean	22,223
Spoon, M. O. Roberts	22,212
Stove, I. De Haven	22,220
Table, J. C. Miller	22,219
Tool handle, W. P. Alger	22,221
Tray, J. Rees	22,215

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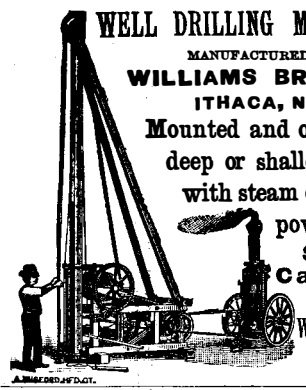

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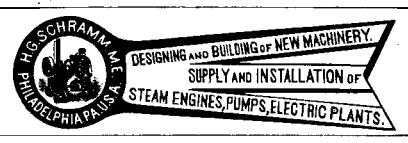
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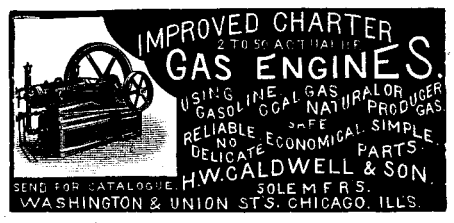

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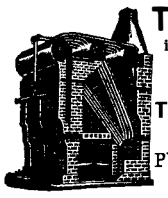

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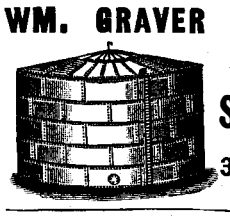

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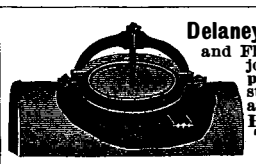

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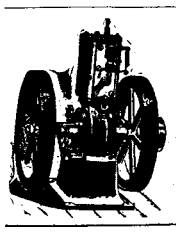

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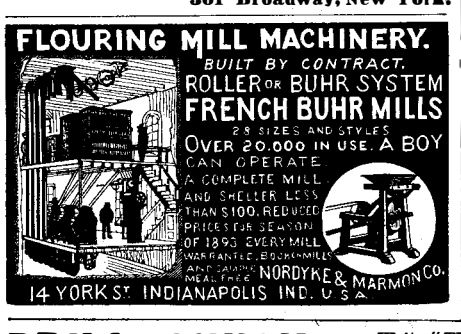
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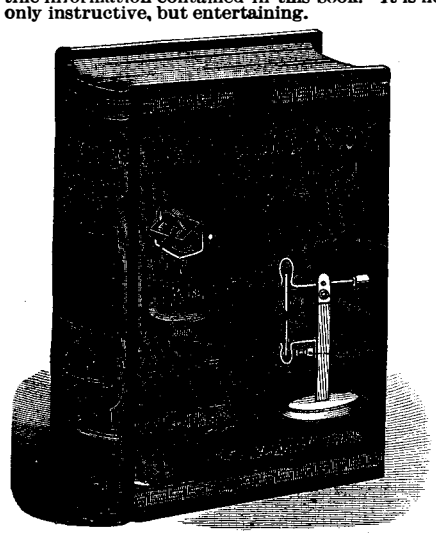

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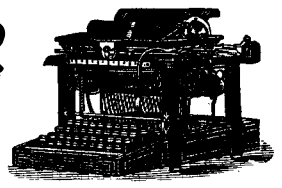

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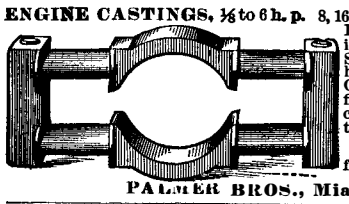

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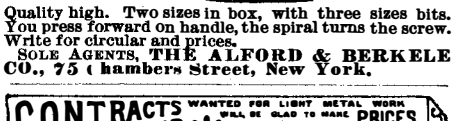

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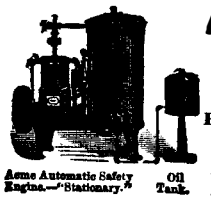

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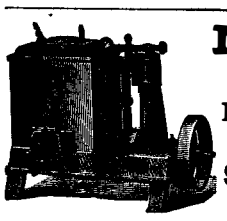

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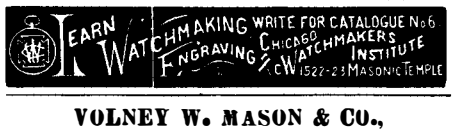

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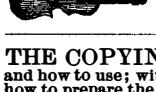

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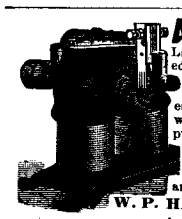

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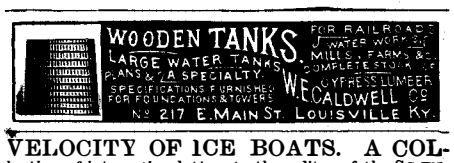
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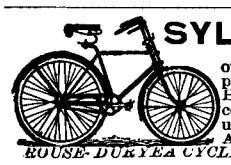

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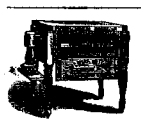

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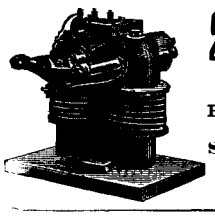

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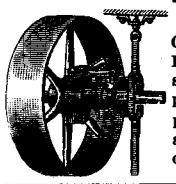

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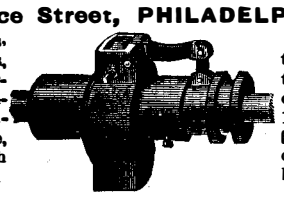

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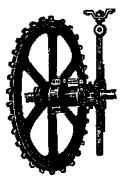

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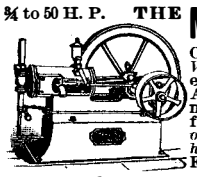

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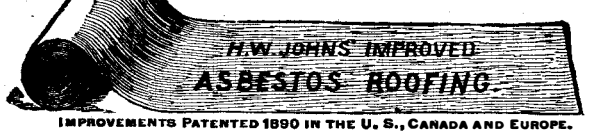

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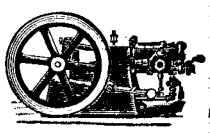

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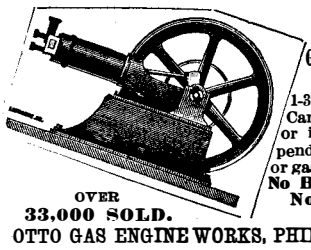

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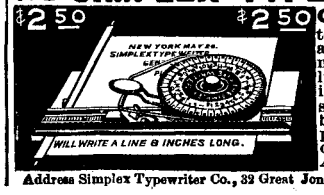

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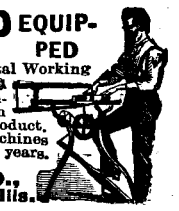

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